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Experience directing Youth to the contemplation of the works of Nature.

STUDIES
OF
NATURE.

BY
JAMES-HENRY-BERNARDIN DE SAINT-PIERRE.

.....MISERIS SUCCURRERE DISCO.

TRANSLATED BY
HENRY HUNTER, D. D.
MINISTER OF THE SCOTS CHURCH, LONDON-WALL.

WITH THE ADDITION OF NUMEROUS
ORIGINAL NOTES AND ILLUSTRATIONS,

BY BENJAMIN SMITH BARTON, M. D.
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IN THREE VOLUMES.

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1808.

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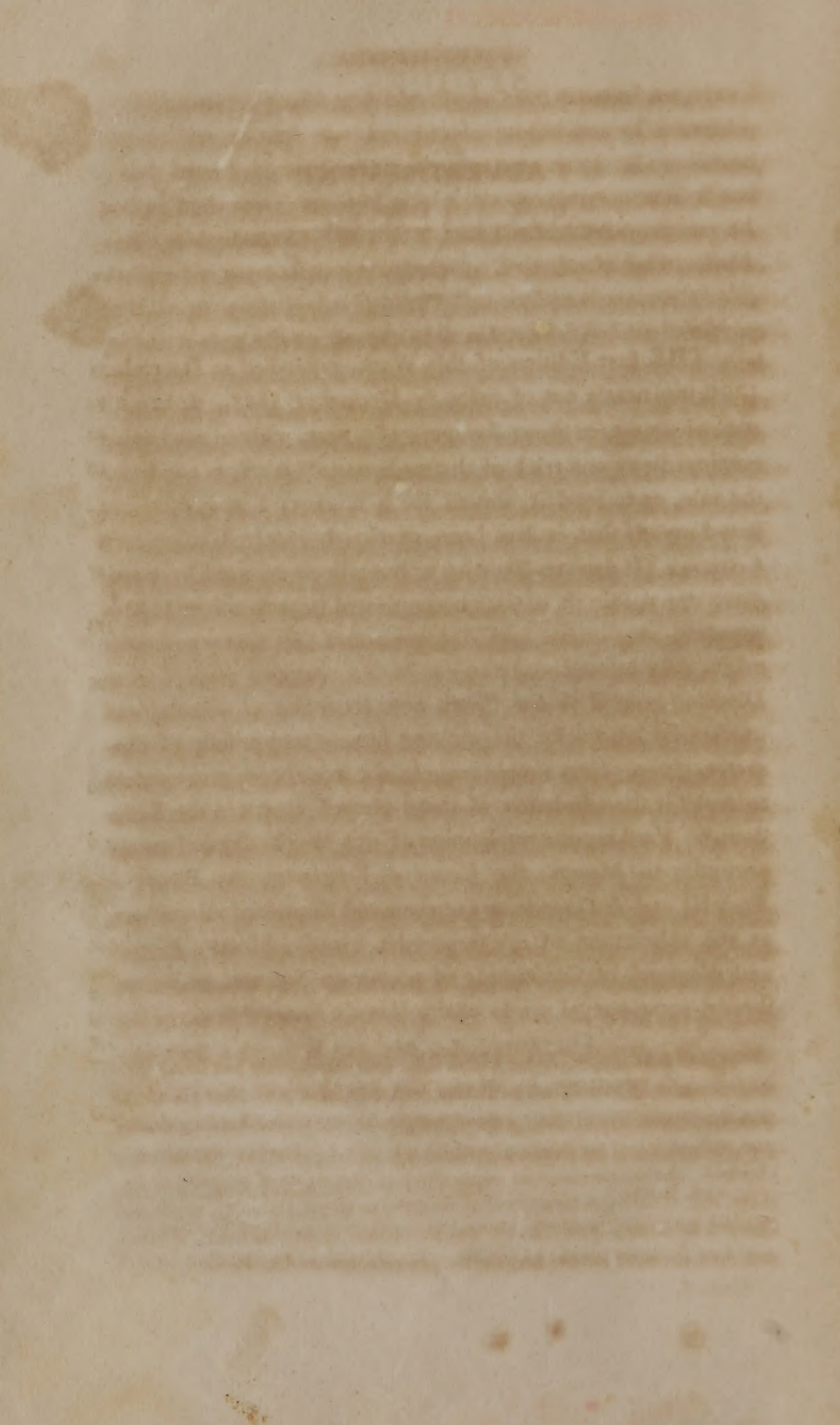
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ADVERTISEMENT

RESPECTING THE WORK IN GENERAL.

THE first Edition of this Work, published in December 1784, was nearly out of print in December 1785. It run it's natural course, in about the space of a year, without my having employed any one trick of the trade to puff it off, to accelerate the sale, or to send it abroad for a market: I may therefore flatter myself that it has been graciously received in my own Country. It appears likewise to have been relished by strangers; for within these six months pirated impressions of it have appeared at Geneva and Avignon; and this literary plunder might have injured me, had not M. *Laurent de Villedeuil*, then Director-general of the Press, now Intendant of Rouen, and universally known for the strictest honour and probity of character, given, on my simple request, the most peremptory orders to prohibit the admission of those pirated copies in the Kingdom.* Farther, the publication of this Work afforded an opportunity to Messrs. the Count *de Vergennes*, the Baron *de Breteuil*, and *de Calonne*, my ancient and illustrious subscribers, at the solicitation of my respectable friends, Messrs. *Hennin* and *Mesnard*, of Conichard, of procuring for me, or for my family, some annual marks of the KING's Benevolence.

* I have been informed that within these four months they had found their way to Lyons, to Marseilles, to Toulon, and undoubtedly to other places; so that the Booksellers of those cities have not been provided for four months past with copies of my Edition, by which the sale of it has been considerably checked. An infringement so unjustifiable of the rights of property of Authors, and of their privileges, and so contrary to Royal authority, ought certainly to be discouraged. And I look for redress against such acts of injustice, from the equity of the Magistrate who presides over the Press

This success ought undoubtedly to have satisfied me ; but I am no less so with the honourable professions of friendship which have been tendered to me, by persons of all conditions, and of both sexes, most of whom are unknown to me. Some distinguished me by their visits ; and others by epistolary addresses the most affecting, conveying their thanks for my Book, as if, in giving it to the Public, I had conferred a personal obligation on themselves. Several of them have invited me to take up my residence at their country seats, and to enjoy those rural scenes, of which, as they are pleased to say, I am so passionately fond. Yes, undoubtedly, I should dearly love a country residence, but a residence which I could call my own, and not another man's.

I made the best acknowledgement in my power to tenders of service so flattering ; but could avail myself only of the goodwill which they breathed. Benevolence is the flower of friendship, and it's perfume always lasts so long as you let it remain on the stem, without gathering it. The afflicted father of a family has informed me, that my Studies were to him the sweetest source of consolation in his distress. An Atheist of a city far distant from Paris, has paid me frequent visits, struck even to admiration, as he said, at the harmonies of plants which I had indicated, and of which he had recognized the existence in Nature.

Personages of real importance, and others who wished to pass for such, have endeavoured to allure me to them, by holding out gilded prospects of melioration of fortune : but as long as I can attain the rare felicity of being beloved, and, what is of still greater importance to me, the power of being useful, so long shall I fly, if I can, the calamity so common, and so humiliating, of being under protection. I speak not thus out of vanity, but to express my gratitude in the best manner I am able, as my custom is, for the slightest mark of kindness shewn me, provided I can believe it sincere.

I have reason to believe, then, from these concurring suffrages of persons of character, that GOD has been pleased to bless

my labours, though chargeable with manifold imperfections. I consider it to be my duty to render the Work as worthy of the public esteem as I can: accordingly I have corrected in this New Edition, the errors of the Press, the blemishes in point of style, and the obscurities in point of meaning, which I remarked in the first; and this partly by myself, partly with the assistance of certain well-informed friends, without, however, retrenching any thing material, and this too in conformity to their wishes. I have only taken the liberty, for the sake of perspicuity, to make some transpositions in the notes. In the same view I have added some others, and among these, in the explication of the plates, a geometrical figure, which renders perceptible to the eye the mistake of our Astronomers, respecting the flatness of the Earth at the Poles, and affords new proofs of the alternate and half-yearly course of the Atlantic Ocean, by the melting of the polar ices. Finally, I have employed a set of new and beautiful types of the foundry of M. *Didot* the younger, that the reputation of this Artist might contribute its share toward the celebrity of the Work.

I should have deemed myself happy to derive information respecting the subject of my Book, from the illumination, and from the candid decisions of literary Journalists. Gentlemen of this description have been left, for this purpose, entirely to their own discretion; for I have neither by myself, or by others, solicited approbation, or deprecated criticism; but they have, for the most part, confined themselves to observations of no essential importance. That Journal which contains of all others, the greatest variety of articles, and which, from the great talents of the persons engaged in conducting it, seemed most likely to instruct me, finds fault with me for having affirmed, that animals were not exposed by Nature to perish, like Man, by famine; and it has objected to me, the case of partridges and hares, in the vicinity of Paris, which sometimes die of hunger in the Winter. But as, on the one hand, these animals are multiplied without end all around Paris; and as, on the other, we mow down every

thing, even to a blade of grass, it necessarily must sometimes happen, that they perish with hunger, especially if the Winter is somewhat long. The famine, therefore, which they endure in our fields, is occasioned by the inconsiderateness of Man, not the improvidence of Nature. Partridges and hares do not die of hunger in the forests of the North, where the Winter lasts for six months together ; they know well how to find under the snow, the herbage and fir-apples of the preceding year, which Nature has buried there to serve them as a seasonable supply.

The other objections raised against some of my positions by the Gentlemen Journalists, are neither more important nor much better founded. Most of them treat as a paradox the cause of the flux and reflux of the Sea, which I ascribe to the alternate fusion of the polar ices ; which ices, in the Winter proper to each Hemisphere, are from five or six thousand leagues in circumference, but in their Summer are not above two or three thousand. But as no one of them has produced a single argument either against the principles of my theory, or against the consequences which I thence deduce, I have nothing to say in reply, unless that, as to the point in question, they have pronounced a decision without having examining into the merits of the cause ; an expeditious indeed, but not perfectly equitable method of administering justice.

The Gentleman who has the greatest number of supporters, and who undoubtedly well merits that support for the taste which he displays in his daily criticisms of literary productions, has objected to me, transciently, that I destroyed the action of the Moon, which is in such perfect harmony with the phenomena of the tides. It is evident that he has not taken the trouble to inform himself, either respecting my new Theory or the old one. I destroy nothing of the Moon's action on the Seas ; but instead of making her to act on the fluid Seas of the Equator, by an astronomical attraction, which produces not the slightest effect on the mediterraneans and lakes of the Torrid Zone itself, I make her to act on the frozen Seas of the Poles

by the reflected heat of the Sun, acknowledged by the Ancients,* demonstrated by the Moderns, and which every man may experimentally demonstrate to himself, with a glass of water.

Besides, it is far from being true, that the phases of the Moon are all over the Earth in harmony with the movements of the Seas. The flux and reflux of the Sea on our coasts follow rather the mean than the real motion of the Moon. In other places they are subject to different laws, which obliged *Newton* himself to admit, "that there must of necessity be, in the periodical return of the Tides, some other mixed cause, hitherto "undiscovered."† The explanation of these phenomena, are which bid defiance to the Astronomical System, are in perfect harmony with my natural Theory, which ascribes to the alter-

* "The Moon dissolves ice by the humidity of her influence." *Pliny's Natural History*, book ii. chap. 101. When the Moon shines, in the nights of Winter, in all her lustre, it freezes, no doubt, very sharply: because that, in this case, the North wind, which occasions this serenity of the air, checks the warming influence of the Moon; but if the wind is stilled ever so little, you see the Heavens covered with vapours which exhale from the Earth, and you feel the Atmosphere softened. I ascribe, as *Pliny* does, to the light of that Star, a particular action on the frozen waters of the Earth and on the Air; for I have frequently seen, in the fine nights of the Torrid Zone, all the clouds of the Atmosphere disperse in an ascending direction; which suggested the proverb in common use among sailors, *the Moon is eating up the clouds*.

Besides, our Naturalists contradict themselves, in supposing that the Moon moves the Ocean, while they refuse it all manner of influence, not only on the ices, but on plants, because, say they, it's heat does not make the fluid to ascend in the thermometer. I do not know, in fact, whether it does, or does not act, on spirit of wine: but what conclusion can be deduced from this? The igneous particles contained in pepper, cloves, pimento, caustics, &c. which have such a powerful action on the fluids of the human body, would they communicate to spirit of wine the slightest tendency to ascend, were you to make an infusion of them with fluid? Fire, as well as the other Elements, undergoes combinations, which multiply it's action in such and such an alliance, and reduce it to mere nothing in a different situation. We must not pretend, then, with our instruments of Philosophy, to arrive at the capability of determining the effects of natural causes.

† *Newton's Philosophy*, chap. xxv.

nate heat of the Sun, whether direct or reflected by the Moon, on the ices of the two Poles, the cause, the variety, and the constant return of the tides ; and especially of the general and alternate Currents of the Ocean, which are the immediate moving principles of those Tides. Our Astronomers, notwithstanding, have never attempted to give any account of the half-yearly versatility of these general Currents, so well known in the Indian Ocean ; nay, they appear to have been hitherto ignorant that there existed similar Currents in the Atlantic. This is however a fact which can no longer be called in question, after the new proofs which I exhibit in the Sequel to the Studies of Nature.

I have advanced then no paradox, respecting causes so evident ; but I have opposed to an astronomical system, totally destitute of physical proof, facts incontrovertible, deduced from all the kingdoms of Nature ; facts which have a multitude of correspondencies, in the flux and reflux of all rivers and lakes which are fed from icy mountains, and which I could easily multiply, and exhibit in new lights, relatively to the Ocean itself, if there were occasion, and if health permitted.

One Journal which, from the title it assumes, would seem destined to inform all Europe, as well as that which, from its title, would be thought reserved for the use of the learned, have thought proper to maintain a profound silence, not only with regard to natural truths so new and so important, but even with respect to my whole Work. Others have opposed to me as a complete refutation the authority of *Newton*, who did not think as I do. I highly respect *Newton* for his genius and for his virtues, but I respect truth still much more. The authority of great names serves but too frequently as a strong-hold to error. It is thus that, on the faith of a *Maupertuis*, and of a *Condamine*, Europe has till now believed, that the Earth was flattened at the Poles. I demonstrate, after their own operations, in the *Explication of the Plates*, at the beginning of the First Volume, that it is lengthened out at the Poles. What answer is it possible to give to the geometrical demonstration

which I produce of it? For my own part, I am perfectly convinced that *Newton* himself would at this day renounce such an erroneous opinion, though he was the first who broached it, if the truth must be told.

The Reader will be, undoubtedly, very much surprised to find men of such celebrity falling into contradiction so unaccountable; a contradiction, adopted on their assertion, and publicly taught in all the schools of Europe; and that no one should have appeared to refute the error, and armed with sufficient courage to maintain the truth. I was so astonished at it myself, that I remained for some time under the belief that I, and not they, had on this article lost every sentiment of evidence. I dared not even disclose my thoughts to any person respecting this, any more than the other objects of these Studies; for scarcely have I met, in my progress through life, any but men sold to the systems which have led to fortune, or to those which promise it. Accordingly, the more I was in the right, being alone, and not backed by puffers, the more disadvantageous was the ground on which I had to combat them. Besides, how is it possible to reason with persons who shroud themselves in the clouds of equations, or of metaphysical distinctions, if you press them ever so little by the sentiment of truth? When such refuges fail, they overwhelm you with authorities innumerable, which have subjugated themselves, without a process of reasoning; and by which they mean to subdue, in their turn, the man especially who has not joined himself to any party.

What then could I have done in this crowd of men, vain and intolerant, to each of whom an European education says, from the days of infancy, *Be the first*; and among so many Doctors, titled and without titles, who have appropriated to themselves the right to freedom of speech, unless it were to shut myself up, as I frequently do, in my freedom of silence? * If I speak there, it is of few things, or of things of slight importance.

* In such society a man is not permitted to remain long in possession of his right of silence; for they who speak, choose to have no hearers but such as are disposed to applaud

In the solitary and unconstrained paths however, through which I followed truth, I recovered my confidence with the new rays which her light diffused, recollecting that the most celebrated scholars had been in all ages as much blinded by their own errors, as the illiterate are by those of other people. Besides, in order to detect the inconsequent reasoning of modern Astronomers, it was necessary to employ only some principles of Geometry, which are level to my capacity, and to that of all mankind. Accordingly, having full conviction from a multitude of observations, meteorological, nautical, vegetable, and animal, that the waters of the polar ices had a natural proclivity southward as far as the Equator, and vexed at being contradicted by the operations, more celebrated than they deserve to be, of Geometricians, I had the courage to examine their results, and became convinced that they ought to be the same with my own. In a former edition, I presented both the one and the other to the Public; theirs remain without a defence, and mine stand unimpeached, though without declared partisans. In a second Edition, I have demonstrated their error on the principles of Geometry; I now expect a decision from the conscience of every candid Reader.

By the prejudices of education our Astronomers have been thus misled; those prejudices which from infancy attach, with-

I have remarked, that the degree of attention which the world pays to it's orators, is always in proportion to the degree of power, or of malignity, which it supposes them to possess. Truth, reason, wit itself, in that case, go for nothing. If you would make the world listen to you, you must make yourself feared. Those accordingly who shine in it, frequently employ turns of phrascology which give you to understand, that they are powerful friends, or dangerous adversaries. Every plain, modest, candid, good man, is therefore reduced to silence before them: it is in his power, however, to get deliverance from this state of constraint, if he can bring himself to flatter his tyrants. But this would in me produce the diametrically opposite effect, for I can flatter only where I love.

Fly from the world then ye who will neither flatter nor malign; for you will lose in it at once the good which you expected from it. and that which is the gift of your own conscience.

out reflection, to fashionable errors that lead to fortune, and which engage us to reject solitary truths that lead to none. They have been seduced by the reputation of *Newton*, which has been objected to myself, and *Newton* had himself been seduced, as usually happens, by his own system. That sublime Geometrician proceeded on the supposition that the centrifugal force, which he applied to the motion of the stars, had flattened the poles of the Earth by acting upon it's Equator. *Norwood*, a Mathematician of England, having found, by measuring the Meridian from London to York, the terrestrial degree to be eight fathom greater than that which *Cassini* had measured in France, "*Newton*," says *Voltaire*, "ascribed this small excess of eight fathom in a degree, to the figure of the Earth, which he believed to be that of a spheroid, flattened towards the Poles; and he concluded that *Norwood*, having taken his Meridian in a region to the northward of our's, must have found his degree to be greater than that of *Cassini*, as he supposed the curve of the Earth measured by *Norwood* to be the longer of the two."* It is evident that, the degree being greater and the curve longer toward the North, *Newton* ought to have concluded that the Earth was lengthened out at the Poles; but he deduced the directly opposite conclusion, namely, that it was flattened there. The truth is, his system of the Heavens occupying all the faculties of his vast genius, prevented his detecting on the Earth a geometrical inconsequence: he adopted therefore, without examination, an experiment which he thought favourable to his system, not perceiving that it was diametrically opposite to him. Modern Astronomers have in their turn suffered themselves to be seduced by the reputation of *Newton*, and by a weakness so apt to warp the human mind, that of attempting to explain all the operations of Nature by a single law. *Bouguer* himself, one of their co-operators, in his *Treatise on Navigation*, book v. chap. v. § 2. page 435, says expressly, that

* *Newton's Philosophy*, chap. xviii.

“on this discovery of the flattening of the Poles, the whole of
“Physics almost depends.”

Our Astronomers then have set out on a ramble to the extremities of the Earth in quest of physical proofs of a celestial system happy and luminous; and they were so dazzled with it beforehand, that they mistook in their turn the truth itself, which, far from the prejudices of Europe, had in deserts just sought refuge under their wings. If the most illustrious of modern Geometricians could fall into so gross an error in his peculiar Science; and if Astronomers, in other respects abundantly filled with a sense of their own sagacity, have, under the influence of his name merely, deduced from their own operations a false conclusion in support of that error; rejected the preceding experiments of their Schools, respecting the sinking of the barometer in the North, with the other geographical observations which contradict it; established on it the basis of all future physical knowledge; and have given it afterwards, by the weight of their own reputation, an authority which has not left to the rest of the Learned World so much as the liberty of doubting; it behoves us, poor, ignorant, and obscure men, to take good care of ourselves, we who search after truth singly for the happiness of knowing it. Let us mistrust then, in our researches after it, all human authority, as *Descartes* did, who by doubting only, dissipated the Philosophy of the age in which he lived, which had so long concealed the laws of Nature from the eyes of all Europe, by means of the prejudice of the name of Aristotle, then held sacred in every University: and let us assume as a maxim, that which led *Newton* himself to so many real discoveries, and after him the Royal Society of London, who have taken it for their motto: **NULLIUS IN VERBA.**

To return to literary journals; if they have, as it were in concert, with-held their approbation from the natural objects of these Studies, one of them has advanced, as I am told, that I had borrowed my Theory of the Tides by means of the polar ices, from certain Latin Authors. This Theory is at last it seems gaining proselytes, since it is exciting envy.

To that imputation this is my answer. Had I known of any Latin Author who ascribed the Tides to the melting of the polar ices, I would certainly have named him as a piece of justice, which the design of my Work, as well as every principle of conscience demanded of me. I have not had, like so many Philosophers, the vanity of creating at my ease a World after my own fancy; but I have endeavoured, with no small labour, to collect the several pieces of the plan of that in which we live, dispersed among the men of all ages, and of all nations, who have observed it with the greatest care. Accordingly, I have taken my ideas of the allongation of the Earth at the Poles, from *Childrey*, *Kepler*, *Tycho-Brhae*, *Cassini*... ..and above all, from the operations of modern Astronomers; of the extent of the frozen Oceans which cover the Poles, from *Denis*, *Barents*, *Cook*, and all the Navigators of the North and South Seas; of the ancient deviation of the Sun from the Ecliptic, from Egyptian Traditions, Chinese Annals, and even from the Grecian Mythology; of the total fusion of the polar ices, and of the universal Deluge which it produced, from *Moses* and *Job*; of the heat of the Moon, and it's effects on ice and water, from *Pliny*, and from recent experiments made at Rome and at Paris; of the Currents and Tides which flow alternately from the Poles toward the Equator, from *Christopher Columbus*, *Barents*, *Marten*, *Ellis*, *Linschoten*, *Abel-Tasman*, *Dampier*, *Pennant*, *Rennefort*, &c. I have quoted all these Observers in terms of high approbation.

Had I known of any Latin Author, who ascribed to the melting of the polar ices the cause of the Tides, in so much as any one part of the Ocean, I would have quoted him in like manner, reserving to myself the glory of the Architect, that of combining and arranging these detached observations; of allotting them to their peculiar seasons and latitudes, in order to clear them of the apparent contradictions, which had hitherto prevented the deduction of any fair consequence from them; and, in a word, of assigning a cause and evident means for effects which, during so many ages, had been involved in mystery. I

have formed, then, one Whole of all these scattered truths, and have deduced from them the general harmony of the movements of the Ocean, of which the heat of the Sun is the first *cause*, the polar ices are the *means*, and the half yearly and the alternate Currents of the Seas, with the diurnal Tides on our coasts, are the *effects*.* Accordingly, if some persons before me have affirmed that the Tides are produced by the melting of the polar ices, which I am to this hour ignorant that any one ever did, I at least am the first who demonstrated it. Other Europeans, prior to *Christopher Columbus*, said that there was another World; but he was the first who landed upon it. If others in like manner had affirmed that the Tides have their origin at the Poles, no one had believed them, because it was an affirmation destitute of proof.

Before it was possible for me to collect and to complete my proofs, and to render them perfectly luminous, it became necessary to dispel those thick clouds of venerable error, such as

* It will be a matter of some difficulty for many persons to conceive how our Tides should possibly, in Summer, re-ascend toward the North Pole, at the very season when the Current which produces them is rushing down from that Pole. They may see a very sensible image of these retrograde effects of running waters, at the bridge of Notre-Dame, at the opening of the arch which is supported by the Quay Pelletier. The Current of the Seine, directed obliquely by a kind of dam, against a pile of that arch, produces there a counter-current, which constantly re-ascends against the course of the river, up to the very bubbling over of the dam. In like manner the meltings of the Northern ices descend in Summer, from the bays adjacent to the Polar Circle, going at the rate of from eight to ten leagues an hour, according to *Ellis*, *Linschoten*, and *Barents*; they flow toward the South, in the middle of the Atlantic Ocean; but coming to meet on their shores, almost in front, Africa and America, where they project on both sides, a violent reflux is produced, to right and left, along the coasts of both Continents, which is forced northward above the Capes Boiador and St. Augustin, which are rendered famous by their Currents. Now, as the sources from which they issue have an intermittent flux of acceleration and retardation, occasioned by the diurnal and nocturnal action of the Sun on the ices of the eastern and western Hemisphere of the Pole, their lateral counter-currents, that is, their Tides, have likewise a similar intermittent flux.

Poles flattened, and washed with Seas clear of ice, which our pretended Sciences had spread between truth and us, and which were sufficient to involve all our Physics in an eternal night. Here, then, is the glory at which I aspire, that of assembling some of the harmonies of Nature, in order to form a concert of them, which should elevate man toward the great AUTHOR of All: or rather I have aimed only at the felicity of knowing them myself, and of pointing them out to my fellow-creatures; for I am ready to adopt any other system, which shall present to the human understanding a higher degree of probability, and to the heart of Man a purer consolation.

To GOD alone glory is to be ascribed; and peace is Man's choicest possession, which is never so pure, and so profound, as in the perception and the feeling of that very Glory which governs the Universe. My highest ambition is the delight of discovering some new rays of it, and, henceforward, my most ardent wish is to have the remainder of my days illuminated by it, to the exclusion, as far as I am personally concerned, of that vain, fantastical, unsatisfying, inconstant glory, which the World gives and takes away at pleasure.

I have been thus diffuse on the right which I claim to the discovery of the cause of the Currents and Tides, from the melting of the polar ices, because having opposed to most of the received opinions on that subject, many observations which I challenge as my own, if each required a special manifesto, to ascertain my property in it, there would be no end to my advancing such pretensions. Besides, if they shall acquire so much celebrity as to procure me, according to the spirit of the age in which we live, perfidious applause, underhand persecution, affected commiseration, all calculated to blast my uncertain, tardy, and hitherto hardly budding fortunes, I solemnly declare that, associated with no party, and able to oppose no one but myself singly to every new adversary, instead of cramming the public prints, as the custom is, with recrimination, abuse, complaint, lamentation, the waste of time, I shall defend myself only on

my own ground, and shall oppose to my enemies, whether secret or avowed, Truth; and nothing but Truth. It's mirror shall be my Egis; and their image reflected from it, shall become to each a Medusa's head. Or rather, may it be my lot, far remote from fickle and treacherous Man, under the roof of a small rustic cot which I can call my own, on the border of a wood, elicit the statue of my Minerva from the trunk of her own tree, and place at last a whole Globe at her feet.

Farther, if the Gentlemen Reviewers have withheld from me their suffrages, respecting objects of so much importance to the progress of natural knowledge, and if others have got the start of me, in precluding my claim to those of the Public, I can already boast the concurrence of illustrious names among all conditions of men. The Sorbonne, to whom I am personally unknown, has done me the honour of adopting the new proofs of the Universal Deluge, which I have deduced from the total fusion of the polar ices: these proofs have been laid down as axiomatical in one of it's theses, maintained for the first time by the Abbé de *Vigueras*, in his academical exercise of the 6th July, 1785.

After all, supposing my friends the Reviewers to have expressed still more reluctance to give an account of opinions, which contradict those of Academies, and strange even to most of themselves: and which must have had a suspicious appearance from their very novelty, they have made me most ample compensation, in applauding me, far beyond my desert, for moral qualities, infinitely beyond the value of physical discoveries and which I should deem myself singularly happy to attain.*

* I ought undoubtedly to distinguish, in the number of my panegyrists, the two first Writers who have given an account of my Work. The one, notwithstanding the smallness of his page, and his propensity to find fault, has announced it in a manner the most flattering; and the other, devoted to the defence of morals and religion, has placed me by the side of a man, at whose feet I would have thought myself happy to sit, had Providence bestowed on me the blessing of being his contemporary

All that is left me, therefore, is to congratulate myself on the general interest with which the Public has received the moral part of this Work. I have however left untouched the great objects of political and moral reform; the one, because it was not permitted me to treat them as my conscience would have directed; and the other, because my plan could not comprehend them. I have restricted myself merely to abuses, which it is in the power of government to rectify: but there are others as universal, which depend entirely on national manners. Such is, among others, the celibacy of most domestic servants. Had it been in my power to have enlarged on this topic, I could have demonstrated that the arrangements of Society never can contravene the laws of Nature; that it is the interest of masters to have their domestics marry, because they pay, let them do their best, the expense of the smuggling libertinism of servants, much more excessive, beyond all question, than that of an honest settlement; for the strumpet always will spend more than the woman of character.

I could have demonstrated the pernicious influence which the bad morals of unmarried servants have on the children of their masters. I could likewise have dilated on the harshness of our pretended Fathers of families, who abandon their servants on the first attack of sickness, or the approach of old age, or when they become parents; on the obligations under which they lie to provide for the necessities of these men, who are their natural friends, the victims of their ill temper, the witnesses of their weakness, and the sources of their reputation, whether good or bad. I could have insisted on the necessity of re-establishing in at least the first rights of humanity, the unfortunate wretches who are deprived of most of the privileges of citizens. I could have demonstrated what an influence their happiness has on the happiness of families and on national felicity, from what I have seen in some Prussian families, where you find in general domestics zealous, affectionate, respectful, and attached to their masters; for they are born, they marry, and they die in the

house of the master ; and you frequently find under the same roof a succession of fathers and sons, who have been masters and servants for two or three centuries successively.

Once more, if I have been somewhat diffuse on the disorders and intolerance of Associations, I have respected States ; I have attacked particular bodies of men, in the view of defending my country, and above all in supporting the corps of HUMANITY. Of this we are all members in particular. But GOD forbid that I should think of giving a moment's pain to any one individual possessed of sensibility : I who have assumed the pen only to support the motto prefixed to my Work ; *Miseris succurrere disco* ; (*the experience of misery has taught me to succour the miserable.*)

My dear Reader, whatever then may be your situation in life, I shall cheerfully submit to your decision, if you judge me as a man, in a Work whose leading object is the happiness of Mankind. If on the other hand I have attained the glory of communicating to you some new pleasures, and of extending your views into the unbounded and mysterious field of Nature, reflect that after all, these are the perceptions but of a man ; that they are a mere nothing compared to that which is ; that they are the shadows only of that Eternal Truth, collected by one who is himself a shadow ; and that a small ray of that Sun of intelligence which fills the Universe, has been playing in a drop of troubled water.

Multa abscondita sunt majora his : pauca enim vidimus operum ejus.

There are yet hid greater things than these be ; for we have seen but a few of his Works. Ecclesiasticus xlii. 32.

EXPLANATION OF PLATE II.

ATLANTIC HEMISPHERE.

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THIS Plate represents the Atlantic Hemisphere, with it's Sources, it's Ices, it's Channel, it's Currents, and it's Tides, in the months of January and February.

Though I am under the necessity of here repeating several observations which have a place in the text, to these I am going to subjoin some others, worthy, I am bold to say, of the Reader's most serious attention.

Observe, in the first place, that the Globe of the Earth is not represented here after the manner of those Geographers who, in their maps of the World, exhibit it as a cavity, in order to give the retreating parts the appearance of being on a great scale. Their projection conveys a false idea of the Earth, by shewing the retiring parts of it's circumference as the widest ; and, on the contrary, the prominent parts of the middle as the narrowest. They present, not a convex globe, but a concave. This figure represents it such as it would appear to an eye placed in the Heavens, when the Atlantic Ocean is turned to it, and in our Winter.

You may distinguish in it the sources of the Atlantic Ocean, which issue in Summer from the North Pole ; it's channel formed by the projecting and retreating parts of the two Continents ; and its discharge, comprehended between Cape Horn and the Cape of Good Hope, by which this Ocean empties itself in Summer into the Indian Ocean.

The opposite side of this Hemisphere, though still in a great measure unknown to us, would present, as well as the Northern, a fluviatric channel with all the same accessories ; sources, ices, currents, and tides, formed not by Continents, but by the projections of islands, and of it's steep beds, which direct during our Winter the course of the Southern polar-effusions into the Indian Ocean. However interesting these new projections of the Globe may be, it was impossible for me to make the expenditure necessary to procure engravings of them. It would have been extremely desirable to have exhibited a representation of both Hemispheres, each in it's Summer and in it's Winter, in order to see their different Currents at each season, and to have presented a bird's-eye view of the Poles themselves, as well in Winter as in Summer, in order to convey an idea of the extent of the cupolas of ice which

cover them, and the currents which issue from them at the different seasons of the year. These different sections would have required at least eight plates, on a scale greater than this, perceptibly to unfold the harmonies of this single branch of my Studies of Nature. Besides, this increase of charts would have led to more particular and more copious details respecting the distributions of the Globe, which I did not mean to treat in this Work, except as the subject occasionally presented itself.

The simple aspect of the Atlantic Hemisphere, in the months of January and February, will be sufficient to render intelligible what we have said respecting the polar ices and their periodical effusions. We shall treat, in their order, of the sources of the Atlantic, of it's ices, of it's channels, of it's currents, of it's tides, and even of it's discharge.

The Sources of the Atlantic Ocean are in Summer at the North Pole. They are situated in the Baltic Sea, the bays of Baffin and Hudson, at Waigat's Strait, &c. It may be remarked on a Globe in relief, that these sources which constitute the origin of the Atlantic Canal, turn round the Pole in a winding course, nearly similar to the circuitous current of a river round the mountain from which it descends; so that they collect in this part all the discharges of the rivers which empty themselves to the North, and carry their waters along into the Atlantic Ocean. From this arises a presumption, that there is in proportion much less polar effusion in the part of the South Seas which is opposite to it. We shall farther see, that Nature has subjected to the Atlantic channel the extremities of the two general currents of the Poles, which there terminate, after having made the circuit of the Globe; and it is by way of opposition to the sources from which these currents issue, that I give to the extremities of their courses the name of mouth. But let us at present confine ourselves to the subject of their sources.

We conceive that the waters of these sources must flow toward the Line, whither they are carried to replace those which the Sun is there every day evaporating; but they have besides an elevation which facilitates their course. Not only are the ices from which they proceed very considerably elevated over the Hemisphere, but the Poles have themselves a great elevation of soil. I ground this assertion, in the first place, on the observations of *Tycho-Brahé* and *Kepler*, who saw the shadow of the Earth oval at the Poles, in central eclipses of the Moon; and on the authority of *Cassini*, who assigns fifty leagues more to the axis of the Earth than to it's diameter in any other direction. In the second place, I have on my side authentic experiments, collected by the Academy of Sciences, but which have no longer been referred to since the opinion became prevalent, that the Earth was flattened at the Poles.

For example, it is well known, that in proportion as you ascend on a mountain, the mercury in the barometer subsides: now, the mercury sinks in the barometer in proportion as you advance northward. It falls about one line, in our Climates, when you ascend to an elevation of eleven fathom. According to the History of the Academy of Sciences, for 1712, page 4, the weight of one line of mercury at Paris, is equivalent to an elevation of ten fathoms and five feet, whereas in Sweden you have to ascend only ten fathom one foot and six inches to make the mercury sink one line. The Atmosphere of

Sweden therefore is not so high as that of Paris, and consequently the ground of Sweden is higher.

To these observations may be farther subjoined those which have been made by the Navigators of the North, who have always seen the elevation of the Sun above the Horizon greater, the nearer that they approached to the Poles. It is impossible to ascribe these optical effects to the simple laws of the refraction of the Atmosphere. According to *Bouguer*, a well known Academician, in his *Treatise on Navigation*, book iv. chap. 3. section 3. "Refraction elevates the stars in appearance; and we are assured, by an infinite number of certain observations, that when they appear to us in the Horizon, they are in reality 33 or 34 minutes under it.—In regions where the air is more dense, the refractions must be somewhat stronger, and they are likewise, every thing else being equal, somewhat greater in Winter than in Summer. In the practice of navigation that difference may be entirely neglected, and perpetual recurrence may be had to the small table placed on the margin."

You see in fact at this part of his work a small table, in which he lays down the greatest refraction of the Sun in the Horizon, at 34 minutes, for all the climates of the Globe. But how came it to pass that *Barents* should have seen the Sun above the Horizon of Nova Zembla, on the 24th of January, in the sign of Aquarius, at five degrees twenty-five minutes, whereas he ought to have been there in sixteen degrees twenty-seven minutes, in order to be perceived in the seventy-sixth degree of northern Latitude, where *Barents* then was? The refraction of the Sun then above the Horizon was nearly two degrees and a half, that is, four times as great, nay more than *Bouguer* supposes it to be, as he assigns only thirty-four minutes, or nearly, for every climate in general.

Barents in truth was very much astonished to see the Sun fifteen days sooner than he expected; and he could not be persuaded that it actually was only the 24th of January, but by observing, that very night the conjunction of the Moon and Jupiter, announced for the Latitude of Venice at one hour after midnight, in the ephemeris of *Joseph Scala*, and which took place that very night at Nova Zembla, at six of the clock of the morning, in the sign of Taurus; which gave him at once the longitude of his hut in Nova Zembla, and the certainty that it must be the 24th of January.

A refraction of two degrees and a half is undoubtedly very considerable. We may, in my opinion, ascribe one half of it to the apparent elevation of the Sun in the very refractive Atmosphere of Nova Zembla, and the other half to the real elevation of the Observer above the Horizon of the Pole. *Barents* accordingly observed from Nova Zembla the Sun in the Equator, just as a man sees him earlier at the summit of a mountain than at it's basis. It is besides a principle which admits of no exception of the harmonic laws of the Universe, that Nature proposes to herself no one end without constraining all the elements to concur at once to the production of it. Of this we have adduced manifold proofs in the course of this Work. Nature accordingly having determined to indemnify the Poles for the absence of the Sun, makes the Moon pass toward the Pole which the Sun abandons: She crystallizes and reduces into brilliant snows the water which covers it; she renders it's Atmosphere more refractive, that the presence of the Sun may be detained longer in it, and restored sooner to it: and hence also there is reason to con-

clude, that she has drawn out the Poles of the Earth themselves, in order to bestow on them a longer participation of the influence of the Orb of Day.

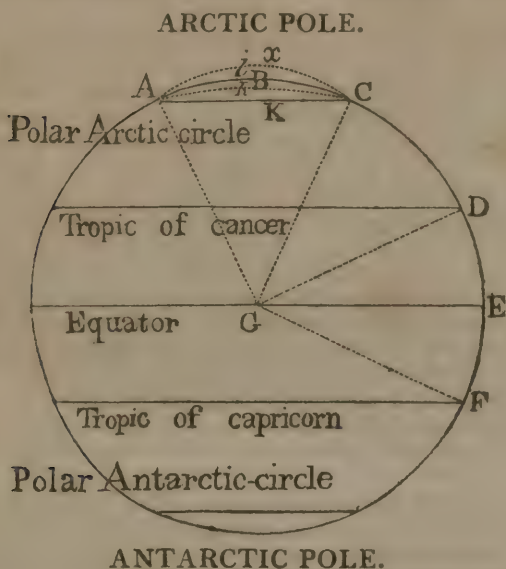
Certain celebrated Academicians have, it is true, laid it down as a fundamental principle, that the Earth was flattened at the Poles. Here what the Academician whom I last quoted says on this subject. He had been employed, with some others, to measure a degree of the Meridian, near the Equator, which they found to contain 56,748 fathoms: "But," continues he, "what is well worthy of attention, the terrestrial degrees have not been found of the same length in other regions where similar operations have been performed, and the difference is too great to be ascribed to the unavoidable errors in observation. The degree upon the polar Circle is found to be 57,422 fathoms. Accordingly it follows, beyond contradiction, that the Earth is not perfectly round, and that it must be higher toward the Equator than toward the Poles, conformably to what other experiments indicate, which it is not necessary here to detail. The curving of the Earth is more sudden toward the Equator in the direction of North and South, as the degrees are smaller there: and the Earth on the contrary is flatter toward the Poles, because there the degrees are greater." *Bouguer's Treatise on Navigation*, book ii. chap. 14. art. 29.

I deduce without hesitation a conclusion diametrically opposite, from the observations of these Academicians. I conclude that the Earth is lengthened out at the Poles, precisely for this reason, that the degrees of the Meridian are greater there than under the Equator. Here is my demonstration. If you place a degree of the Meridian at the polar Circle, over a degree of the same Meridian at the Equator, the first degree, which is 57,422 fathoms, would exceed the second, which contains only 56,748 fathoms, by 674 fathoms, conformably to the operations of the Academicians themselves. Consequently if you were to apply the whole arch of the Meridian which crowns the polar Circle, and which contains 47 degrees, to an arch of 47 degrees of the same Meridian, near the Equator, it would produce a considerable protuberance, it's degrees being greater. This polar arch of the Meridian could not extend in length over the equinoctial arch of the same Meridian, because it contains the same number of degrees, and consequently a chord of the same extent. If it extended in length, exceeding the second at the rate of 674 fathoms for each degree, it is evident that it would, at the extremity of it's 47 degrees, get out of the circumference of the Earth; that it would no longer pertain to the circle on which it was traced, and that it would form, on applying it to one of the Poles, a species of flattened mushroom, which would project round and round, it's brim touching the Earth in no one point.

In order to render the thing still more apparent, let us always suppose that the profile of the Earth at the Poles is an arch of a circle, and that it contains 47 degrees, is it not evident, if you trace a curve on the inside of this arch, as the Academicians do, who flatten the Earth at the Poles, that it must be smaller than this arch within which it is described, as being contained in it; and that the more this curve is flattened, the smaller it becomes, as it will approach more and more to the chord of the arch, that is to a straight line. Of consequence, the 47 degrees, or divisions, of this interior curve, will be, each in particular, as they are when taken together, smaller than the 47 degrees of the arch of the containing circle. But as the degrees of the polar

curve are, on the contrary, greater than those of an arch of a circle, it must follow that the whole curve should likewise be of greater extent than an arch of a circle: now it cannot be of greater extent, but on the supposition of it's being more protuberant and circumscribed round this arch, the polar curve of consequence forms a lengthened ellipsis.

I here present a figure of the Globe, which I have got engraved, in order to render the mistake of our Astronomers perceptible to every eye.



Let x be the unknown arch of the Meridian comprehended above the arctic polar circle ABC . and let DEF be the arch of the same Meridian comprehended between the Tropics. These two arches are, it is well known, each of 47 degrees. But though they both are subtended by equal angles, AGC and DGF , they are by no means of equal expansion; for, according to our Astronomers, a degree of the Meridian at the polar circle is greater, by 674 fathoms, than a degree of the same Meridian near the Equator. It follows therefore that the unknown polar arch x of 47 degrees, exceeds in extent the equinoctial arch DEF , which likewise contains 47 degrees; by 47 times 674 fathoms, which amount to 31,678 fathoms, or twelve leagues and two thirds. The question now to be determined then is, whether this unknown polar arch x is contained within the circle, in the curve $A\hat{A}C$, or coincides with it, as ABC , or falls without it's circumference, in the direction $A\hat{A}C$.

The unknown polar arch x cannot be contained within the Globe, as $A\hat{A}C$, as is pretended by our Astronomers, who will have it to be flattened there. for if it were contained, it would be evidently smaller than the spherical arch ABC which surrounds it, conformably to this axiom, that the thing contained is smaller than what contains it; and the more this curve $A\hat{A}C$ shall be flat-

tened, the less will be its extent, as it will approach nearer and nearer to it's chord, that is, the straight line AKC.

On the other hand, this polar arch x cannot coincide with the spherical arch ABC, for it exceeds it by twelve leagues and two thirds. It must belong therefore to a curve which falls without the circumference of the Globe, as in the direction AiC. The Globe of the Earth then is lengthened at the Poles, as degrees of the Meridian are greater there than at the Equator. Astronomers have consequently erred in concluding from the magnitude of those degrees, that the Poles were flattened.

I shall conclude this demonstration by an image more trivial indeed, but equally sensible. If you divide the two circumferences of an egg, in length and breadth, each into 360 degrees, would you conclude that this egg was flattened toward it's extremities because the degrees of it's circumference in length were greater than the degrees of it's circumference in breadth? What is very singular here is, that Academicians employ the same figure nearly to deduce results which flatly contradict each other. They represent the Globe of the Earth like a Dutch cheese. They take it for granted that the Globe is very elevated over the Equator. "The curve of the Globe," says *Bouguer*, in the passage above quoted, "is more sudden toward the Equator, in the direction of North and South, because the degrees there are smaller: and the Earth, on the contrary, is flatter toward the Poles, because the degrees there are greater. One would imagine that the Equator was distinguished only by the greatest rapidity of motion performed in the space of twenty-four hours; but it is marked by a distinction still more real, namely, a continued elevation, which must be about six marine leagues and a half quite round the Earth, and every where at an equal distance from both Poles."

We here see the strange consequence deduced at once from the flattening of the Earth at the Poles, and from the magnitude of the degrees of the Meridian at that part, which necessarily give to the polar Circle a projection beyond it's circumference: those which may be deduced from the elevation and more sudden curve of the Equator, would be no less extraordinary. They are precisely these, if both the one and the other existed, there would be no Sea under the Equator; because the course of the waters would be in this case determined by the elevation of six leagues and a half, and by the more sudden curvature of that part of the Earth to withdraw from it, and by the power of gravity to flow toward the flattened Poles nearer to the centre, and there to re-establish the spherical segment which the Academicians have cut off. According, on this hypothesis, the Seas would cover the Poles, and would there be of a prodigious depth, whereas we should have nothing but elevated Continents under the Line. But Geography demonstrates the direct contrary; for it is around the Line that we find the greatest Seas, and a great quantity of Land barely up to the level; and, on the contrary, elevated countries and lofty beds of water are very frequent, especially toward the North Pole.

Let us now proceed to consider the polar ices. Though they are here represented precisely in the fugitive and least visible parts of the Globe, it is easy to form a judgment of their very considerable extent from the arch of the Meridian which embraces them. At the South Pole, where they are in a smaller quantity, having just undergone all the ardour of the Summer of

that Hemisphere, they still extend from the Pole to the 70th degree of southern Latitude at the least. They there form, accordingly, a cupola of an arch of more than 40 degrees, which at the rate of twenty-five leagues at least to a degree, for degrees at this part of the Globe, conformably to the experience of our Academicians, are greater than toward the Equator, give a breadth of more than a thousand and twenty leagues, or a circumference of more than three thousand. It is impossible to call in question these dimensions, for they are taken from the last observations of Captain *Cook*, who made the tour of this cupola during their Summer.

The ices of the North Pole are much more extensive, because they are represented in their Winter. On both the one and the other a crest is expressed of about twenty leagues of elevation at the Poles. I shall not here repeat what I have already said respecting the height of those ices which are discovered floating at the extremities of their cupolas, the elevation of which extends to twelve, nay, to fifteen hundred feet. I was exceedingly desirous of procuring a representation around these ices of an irradiation, or kind of *Aurora Borealis*, which might have rendered perceptible their circular extent, and have heightened the picturesque effect of the Globe by rendering it's Poles radiant; for the South Pole too emits nocturnal coruscations, as *Cook* observed; and it appears that these glories owe their origin to the ices. But *M. Moreau* the younger, who made the drawings for the plates of this Work, and particularly those under review, with all the intelligence and complaisance which characterize him, made me sensible that the Chart had not a field sufficiently ample. He has, in other respects, rendered these polar ices abundantly luminous to make them distinguishable, without eclipsing the contours of the islands and of the Continents which they cover.

As to the Atlantic channel, you can easily distinguish in it the prominent and the retreating parts of the two Continents in correspondence with each other. If to this you add the sinuosity of it's source toward the North, which seems to pursue a serpentine progress round our Pole, and it's wide and divergent mouth, formed by Cape Horn on the one side and the Cape of Good-Hope on the other, by which it discharges itself for six months into the Indian Ocean, as we shall presently see, you will perceive in it all the proportions of a fluviatic canal. As to it's declivity, in taking its departure from the Pole, to empty itself as far as in the Indian Ocean and South Sea, by the Cape of Good-Hope, I believe it to be, as I have said in the text, nearly the same with that of the course of the river Amazon.

Let us now consider the course of the polar effusions produced by the action of the Sun on the ices of the Poles. There issues every year a general Current from that which is heated by the Sun; and as that great Luminary visits them alternately, it follows that there must be two general opposite currents which communicate to the Seas their movement of circulation, and which are known in India by the name of the easterly and westerly monsoons, or Winter and Summer.

This being laid down, let us examine the effusions of the South Pole, which is here represented in it's Summer. The general Current which issues from it divides into two branches, the one of which sets in toward the Atlantic Ocean, and penetrates even to it's northern extremity. When this branch comes to force it's way between the prominent parts of Africa and America.

finding itself straitened on passing from a wider to a narrower space, it forms on the coast two counter-currents, or *vortices*, which proceed in contrary directions. The one of these counter-currents runs to the East, along the coast of Guinea, up to the fourth degree South, according to the testimony of *Dampier*. The other takes it's departure from Cape St. Augustin, proceeds to the South-West, along the coasts of Brasil, up to *Maire's*-Strait inclusively. This effect is the result from a law in Hydraulics, the operation of which is generally known: it is this, that as often as a current passes from a wider channel into a narrower, it forms on the sides two counter-currents. The truth of this may be ascertained by observing the current of a brook, or the passage of the water of a river under the arches near the abutment of a bridge, &c. Accordingly the current bears to the East, along the coasts of Guinea, and to the South-West, along the coasts of Brasil, during the Summer of the South Pole. But in the middle of the Atlantic Ocean, and beyond the strait of the two Continents, it pushes on to the North in full force, and advances to the very northern extremities of Europe and of America, bringing us twice every day along our coasts the tides of the South, which are the half-daily effusions of the two sides of the South Pole.

The other branch which issues from the South Pole, takes a direction to the westward of Cape Horn, rushes into the South Sea, produces in the Indian Ocean the Eastern monsoon, which takes place in India during our Winter; and having made the tour of the Globe by the West, comes to the East, to unite itself by the Cape of Good Hope to the general Current which enters into the Atlantic Ocean. It is possible partly to trace on the Chart this general Current of the South Pole, with it's two principal branches, it's counter-currents and it's tides, by the arrows which indicate it's direct, oblique, and retrograde movements.

Six months after, that is in our Summer, commencing toward the end of March, when the Sun at the Line begins to forsake the South Pole, and proceeds to warm the North, the effusions of the South Pole are stayed; those of our Pole begin to flow, and the Currents of the Ocean change in all Latitudes. The general Current of the Seas then takes it's departure from our Pole, and divides, like that of the South, into two branches. The first of these branches derives it's sources from *Waigat's*, *Hudson's* bay, &c. which then flow in certain straits with the rapidity of a sluice, and produce toward the North tides which come from the North, from the East, and from the West, to the great astonishment of *Linschoten*, *Ellis*, and other Navigators, who had been accustomed to see them come from the South along the coasts of Europe.

This Current, formed by the fusion of most of the ices of the North of America, of Europe, and of Asia, which at that season present a circumference of almost six thousand leagues, descends through the Atlantic Ocean, passes the Line, and finding itself confined at the same Strait of Guinea and Brasil, it forms on it's sides two lateral counter-currents, which set in northward, as those formed six months before by the Current of the South Pole set in southward. These counter-currents produce on the coasts of Europe, the tides which always appear to come directly from the South, though they usually come at that season from the North.

The branch which produces them advances afterward to the South, doubles the Cape of Good-Hope, takes it's course eastward, forms in the Indian Ocean the westerly monsoon; and having encompassed the Globe even to the South-Sea, it proceeds to Cape Horn, re-ascends along the coast of Brasil, and there produces a current which terminates at Cape St. Augustin, and is opposed to the principal Current which descends from the North.

The other branch of the Current, which in Summer flows from our Pole on the opposite side of our Hemisphere, issues through the passage called the North-Strait, situated between the most easterly extremity of Asia and the most westerly of America. It descends into the South-Sea where it is re-united to the first branch, which then forms, as has been said, the westerly monsoon of that Sea. Besides this branch which issues by the North-Strait, receives much less of the icy effusions than that of the Atlantic Ocean, because the deep bays which are at the sources of that Ocean, and the contours of these same sources, which surround the Pole spirally, receive, as we have seen, the greatest part of the icy effusions of the North Pole, and pour them into the Atlantic Ocean.

The Ocean accordingly flows twice a year round the Globe, in opposite spiral directions, taking it's departure alternately from each Pole, and describes on the Earth, if I may venture to say so, the same course which the Sun does in the Heavens.

This Theory, I confidently affirm, is so luminous, that by means of it a multitude of difficulties may be resolved, which involve in much obscurity the journals of our Navigators. *Froger*, for example, says, that in Brasil the Currents come in conformity to the direction of the Sun; that is, they run northward when he is in the northern signs of the Zodiac, and southward when he is in the southern signs. It is impossible assuredly to explain this versatile effect from the pressure or the attraction of the Sun and of the Moon between the Tropics, as these two Luminaries never transcend their bounds, and always proceed in one direction, from East to West: but here is the solution. When this Current of Brasil runs to the South in our Winter, it is the general counter-current of the South Pole, which is then setting in to the North; and when this Brazilian Current runs to the North in our Summer, it is the extremity of this same general Current which returns by Cape Horn.

The same thing does not take place respecting the Current in the Gulf of Guinea which is opposite, and which runs always to the East, though it be in precisely the same situation, for in our Winter this Current in the Gulf of Guinea is the extremity of the general Current of the South Pole, which returns by the Cape of Good-Hope, and which at that season sets in to the North along the coasts of Africa, from the thirtieth degree of South Latitude, as far as to the fourth degree of the same Latitude, according to the testimony of *Dampier*. But this extremity of the general Current which sets in to the North, and which then takes it's departure from the fourth degree South to join the general Current, does not enter into the Gulf of Guinea, because of the prodigious retreat of that Gulf; so that in this part only the Sea flows always to the East, conformably to the observation of all African Navigators.

I shall support the principles of my Theory by well-authenticated facts, supplied by Navigators of the highest credit. Hear what *Dampier* says of the Currents of the Ocean, in his *Treatise of the Winds*, pages 386 and 387.

" Besides, it is certain that, universally, Currents change their courses at certain seasons of the year : in the East-Indies, they run from East to West one part of the year, and from West to East the other part. In the East-Indies and in Guinea, they change only about the time of full Moon. But this is to be understood of the parts of the Sea which are at no great distance from the coast : not but that there are likewise very powerful Currents in the great Ocean which are not subjected to these laws ; but that is not common.

" On the coast of Guinea the Current sets in to the East, except at full Moon or about it. But to the South of the Line, from Loango up to 25 or 30 degrees, it runs with the wind from South to North except toward full Moon.

" To the East of the Cape of Good-Hope, from the thirtieth degree to the twenty-fourth South Latitude, the Current sets in to the East, from the month of May to October, and the wind blows during that period from West-South-West, or South-West ; but from October to May, when the wind is between East-North-East and East-South-East, the Current sets in to the West ; and this is to be understood of five or six leagues distance from land up to fifty, or thereabout ; for at five leagues from land there is no Current, but we have a tide ; and beyond fifty leagues from land, the Current entirely ceases, or becomes imperceptible.

" On the coast of India, to the North of the Line, the Current runs with the monsoon. But it does not change quite so soon sometimes by three weeks or more ; after that it changes no more till the monsoon is fixed in the opposite direction. For example, the western monsoon commences about the middle of April, but the Current does not change till the beginning of May : and the eastern monsoon commences about the middle of September, but the Current changes not till the beginning of October."

Dampier seems to ascribe the cause of these Currents to the winds, which he calls Monsoons. But this is not the proper place for investigating the cause of the atmospheric revolution, which however likewise depends on the Poles, whose Atmospheres are more or less dilated in Winter and in Summer, and whose revolutions must precede those of the Ocean. I shall confine my attention at present to the retardation of the westerly Current, which does not affect the Indian Ocean till the month of May, in order to demonstrate, that it is the same which takes its departure from our Pole in the month of March, and which takes place in various regions of India at eras proportional to the distance of the point from which it sets out.

This Current arrives then toward the month of April at the Cape of Good-Hope ; and this it is which renders the passage round the Cape so difficult to vessels returning from India in Summer. I shall once more support myself on this ground by the authority of *Dampier*, in his *Voyage Round the World*, vol. ii. chap. 14. This was on his return from India to Europe.

" We lost time in trying to reach the Cape, which we could not make till the month of October or November ; and it was now only the end of March. In fact, it is not usual to make the Cape after the tenth of May." In addi-

nion to this, the Dutch East-India Company do not permit their ships to remain there later than the month of March, because from that period the Winds and the Currents steadily set in from the West, which drive the shipping on the coast: hence we see that this Current, which comes from the West, in doubling the Cape, arrives there in the month of April.

From the preceding passage, in *Dampier's Treatise on Winds*, we have seen that this westerly Current reached the coasts of India toward the middle of May: I shall produce another authority to prove that it reaches about the middle of June, the island of Tinian, which is much farther to the East. I extract it from *Anson's Voyage*, chap. 14; in the year 1742, on the subject of the island of Tinian. "The only good anchoring ground for large ships is off the South-West part of the island. The bottom of this road is filled with rocks of coral, very sharp-pointed. It is unsafe to anchor there from the middle of June to the middle of October, which is the season of the westerly monsoons; and the danger is farther increased by the extraordinary rapidity of the current of the tide which sets in to the South-West between this island and that of Agnigan. During the other eight months of the year, the weather there is steady." Observe, by the way, that while the monsoon or the current comes from the West, the tide bears in a contrary direction between those two islands; which is a confirmation of what we have said, that tides are for the most part only the counter-currents of general Currents forced through narrow straits.

It is accordingly evident that this Current, which leaves our Pole in March, reaches the Cape of Good-Hope in April, the coast of India in May, the island of Tinian by the middle of June; and that it traces round the Globe the spiral line which I have indicated. It might be possible to calculate the velocity by the time employed in running over these several distances, and in reaching the other points of Latitude, till it gets up with Cape Horn, from which it sets in to the North as far as Cape St. Augustin, where it meets the general Atlantic Current toward the end of July. But the detail of so many curious circumstances would carry me too far.

In no one respect is it possible to ascribe the general Currents of the Indian Ocean, which, as has been said, set in for six months to the East and six months to the West, to the attraction or pressure of the Sun and of the Moon, between the Tropics; for these Orbs move invariably in one direction, and their action is the same at all times, within the extent of that Zone to which their motion is restricted. Besides, if their action were the cause of it, when the Sun is to the North of the Line, the westerly monsoon ought to be felt on the coasts of India as early as the month of March, for the Sun is then nearly in the Zenith of the Indian Ocean; but it becomes not perceptible till six weeks after, that is till the month of May.

On the contrary, when the Sun is to the South of the Line, and at the greatest distance from the Indian Ocean, the Monsoon takes place there a little after our autumnal Equinox, that is, in the month of October. Hence it is evident that these revolutions of the Indian Ocean have not their focuses under the Equator, but at the Poles; and that the revolution of the month of March, which proceeds from the North by the West, takes six weeks to render itself perceptible in India, because of the vast circuit which it is obliged to make round the Cape of Good-Hope: whereas that of the South Pole,

which commences in the month of September, arrives much sooner, because it has no circuit to make; and finally, that the era of these versatile revolutions commences precisely at the Equinoxes, that is, the very moment when the Sun withdraws from the one Pole on his way to warm the other.

It is manifest therefore that the half-yearly and alternate Currents of the Indian Ocean derive their origin from the half-yearly and alternate fusions of the ices of the North and South Poles; and that their direction from East to West, and from West to East, is determined in this Ocean by the very projection of the Continent of Asia.

The Atlantic Ocean has in like manner two half-yearly and alternate Currents which have the same origin, but one natural direction from North to South, and from South to North, though with some deviation from West to East and from East to West, by the very projection of the Atlantic channel. Our Navigators go on the supposition that in this channel there is but one perpetual Current, which in our Hemisphere always runs from South to North. Into this mistake they have been led by the course of the tides, which in fact always do set in to the North along our coasts and those of Bahama, but especially by our astronomical system, which ascribes all the movements of the Ocean to the action of the Moon between the Tropics.

How many errors may one single prejudice introduce into the elements of human knowledge! It blinds even the most enlightened of Mankind to such a degree, as to make them resist the clearest evidence, and to reject for a long series of ages, the experience which every year is accumulating.

I have collected from a multitude of Sea Voyages, and principally from those which Captain *Cook* performed round the World, with equal sagacity and intelligence, a great variety of nautical observations, which demonstrate, that the Currents of the Atlantic Ocean are alternate and half-yearly, like those of the Indian Ocean. Nevertheless the very persons who made and who relate these observations, misled by the prejudice that the action of the Moon between the Tropics alone communicates motion to the Seas, and unable to reconcile their Currents with the course of that Luminary, deduced only this conclusion, that they were naturally irregular, and their cause inexplicable.

Had they adhered to their own experience, which assured them that these Currents changed twice every year; that in the Indian Ocean they run for six months in the same direction with the course of the Moon, and six months directly opposite to it; and in the Atlantic Ocean in directions which have no relation whatever to the course of that Star; that they are much more rapid as you approach the Poles than between the Tropics, under the very gravitation of the Moon; and finally, that they diverge from the Pole that is heated by the Sun toward that which he has deserted; they would then have referred the causes of these variations to the Summer and Winter of each Hemisphere; and they would have dissipated in part that cloud of error with which our pretended Sciences have veiled the operations of Nature.

Though these nautical observations are decisive as to myself, for they have been made by enlightened partisans of the Astronomical System, which they totally subvert, while they confirm the truth of my Theory, I shall however quote two still more curious, more authentic, and more impartial than all the others, because they have not been picked up by men bred to the Sea, and who consequently have neither the prejudices nor the systems of the profes-

sion. The one has the inhabitants of a whole kingdom to vouch for him; and the other one of the most terrible epochas of the naval History of Europe; and both of them wonderfully confirm one of the most agreeable harmonies of the vegetable History of Nature, the elements of which I have presented in the emigration of plants.

From the first of these observations we shall demonstrate, that the Atlantic Current comes in fact from the South, and sets in northward, as Navigators believe, but this only during our Winter. It is accordingly produced in this direction, by the effusion of the ices of the South Pole, which in our Winter flow toward the North; and not by the action of the Moon between the Tropics, according to our Astronomers, because at that very season the Navigators of the Southern Hemisphere have found beyond the Tropics this same Current coming from the South, which assuredly could not take place if this Current were produced by the action of the Moon on the Equator; for on this hypothesis, it would flow in a contrary direction in the Southern Hemisphere. But this is by no means the case, as I am able to prove by the Journals of *Abel Tasman*, of *Dampier*, of *Fraser*, of *Cook*, &c. who found beyond the Tropics, in the Southern Hemisphere, this Current setting in from the South, but only during our Winter.

By the second of these observations we shall demonstrate, that the Atlantic Current comes from the North, and sets in southward in our Hemisphere, contrary to the opinion of Navigators, but only during Summer. Of consequence it then proceeds directly from the effusions of the ices of the North Pole, which in our Summer flow toward the South; and it evidently destroys by this direction toward the Equator, the pretended action of the Moon between the Tropics, which, according to our Astronomers, impresses on the Ocean a motion toward both Poles.

The first of these observations is related by Mr. *Thomas Pennant*, a well-informed English Naturalist, unfettered by prejudice and by system, at least as far as this important subject is concerned. It is extracted from his Voyage, in 1772, to the Hebrides, small islands on the West of Scotland.* “But,” says this enlightened Traveller, “what is more real and more worthy of attention is this, that there are frequently found here (on the island of *Ilay*) on the coast of all the Hebrides and Orkney Islands, the seeds of the plants which grow in Jamaica and the adjacent islands; such as those of the *do-lichos urens*, *guilandina bonduc*, *bonducetta*, the *mimosa scandens* of *Linnaeus*. These seeds, which are called Molucca beans, grow on the banks of the rivers of Jamaica; and thence wafted along by the westerly winds and currents, which predominate for two-thirds of the year in that part of the Atlantic, they are driven even to the shores of the Hebrides. The same thing sometimes happens to the turtles of America, which are caught alive on these coasts; and this is put beyond the reach of doubt, since there was found on the coast of Scotland a part of the mast of the *Tilbury* man of war, which took fire and was burnt near Jamaica.”

Mr. *Pennant* has neglected to inform us at what season these seeds and those turtles reach the western coast of Scotland. Such omission of date is an essential defect, though very common with Travellers, who frequently

* Printed at Geneva in 1785, in a Collection of Voyages and Travels to the Mountains and Islands of Scotland; Paris, Nyon senior, 2 vols, 8vo. vol. 1, pages 216 and 217.

neglect those of even their own particular observations. It is only however by means of these dates that we are enabled to take a glimpse of the combined harmonies of Nature. What shall we think then of the taste of our Compilers of Voyages and Travels, who retrench these as tedious and unimportant circumstances? It is easy to see notwithstanding, in the present case, that the seeds from the rivers of Jamaica and the turtles of America arrive in Winter on the coasts of the Hebrides and of the Orkneys being driven thither, according to Mr. *Pennant*, by the "westerly winds and currents," which "predominate there," says he, "two-thirds of the year."

Now it is well known that the westerly winds blow there all the Winter through, which is confirmed in this relation by it's own proper testimony, and in the same Collection by other Travellers to Scotland. After all it cannot possibly be the West-wind which wafts those seeds and those tortoises so far from Jamaica northward. The winds have no hold of bodies level with the surface of the water, and assuredly those from the West could not drive them to the North. Nay, Currents from the West could not possibly produce this effect, for they would hurl them to the East; and as Jamaica is about 18 degrees to the North of the Line, these seeds and tortoises would be driven ashore on the coast of Africa of the same Latitude, and not in the 59th degree North on the coasts of the Hebrides and Orkneys, where in fact they do come ashore.

The Current therefore which wafts them along proceeds in a northern direction, tending a little toward the East precisely as the Atlantic channel itself does in that part of it. Accordingly the important observations of the inhabitants of Scotland on the subject of the grains of the Island of Jamaica, of the turtles of America, and of a fragment of the mast of the *Tilbury* thrown upon their coasts, incontestibly prove that the Atlantic Current comes from the South and sets in to the North, as Navigators are disposed to believe. But it has this direction only in our Winter; for I am going to demonstrate by another observation no less curious, that in Summer, and in the same Latitudes, the Atlantic Current comes from the North and sets in to the South, in direct opposition to the pretended action of the Moon between the Tropics and to the contrary opinion of Navigators. But I ought not to say *opinion*, for they have not a well-informed opinion on the subject.

We have already produced the testimony of the most respectable northern Navigators, who unanimously bear witness that the Atlantic Current comes from the North and sets in to the South in Summer in it's northern extremity: such are these of *Ellis*, of *Barents*, of *Linschoten*, &c. who having navigated in Summer toward the vicinity of the arctic polar Circle, attest that the Currents and even the tides have a southerly direction, and descend from the North, or at most from the North West or North East, according to the bearing of the bays into which they are penetrated.

We have besides adduced in support of this important truth the testimony of the Navigators of North-America, quoted by *Denis*, Governor of Canada, who attests that the Currents of the North annually convey in Summer toward the South long banks of floating ices of a very considerable depth and elevation, which run a-ground so far to the South as the banks of Newfoundland; and finally, we have quoted the observation of *Christopher Columbus*, who in a much more southern Latitude, nay approaching to the Tropic of Cancer,

found by experience in September, that the middle of the Atlantic channel run southward, and consequently descended from the North. To these authorities we might subjoin those of a multitude of other Navigators, who paid attention only to the driving of their ships, and were convinced in Summer of the existence of this northern Current without daring to admit it, or venturing to oppose their own experience to an Astronomical System which had got into vogue.

But that I may omit nothing relative to a subject so essential to Navigation and to the Study of Nature, and in order to remove every possibility of doubt as to the existence of this northern Current in Summer, we shall confine ourselves to a single observation, but connected with a well-known historical event. This observation is the less liable to suspicion that it is related without an intention to favour any one System, by a Traveller who was neither Mariner nor Naturalist, and who deduced no other consequences from it except those which concerned his fortune and his liberty. It is that of *Souchu de Rennefort*, Secretary to the Supreme Council of Madagascar, on leaving the Azores the 20th of June, 1666, at that time on his return to Europe. *History of the East-Indies*, book iii. chap. 5.

"From 40 degrees," says he, "up to 45, we saw broken masts, sail-yards, and round-tops of ships, which awakened an apprehension that some dreadful naval disaster had taken place. We were not a little afraid that these fragments might have run foul of one of our convoy, a vessel of considerable burden called the *Virgin*, an old crazy ship and very leaky. It has been since ascertained that this wreck was occasioned by the naval engagement which took place between the French and Dutch on one side and the English on the other. It would have been a happiness to those concerned to have known this sooner."

In fact the vessel on board of which *Rennefort* was, and to whom it was unknown that France and England were at war, had the misfortune to be taken and sunk by an English frigate, as far up the channel as Guernsey, ten days after this observation, that is the 8th of July.

This horrible devastation, scattered over the Ocean through a space of three degrees, or 75 leagues, was the effect of the most obstinate and bloody combat that ever took place on that element between the English and the Dutch. It began the 11th of June, and lasted four days. The English fleet consisted of 85 ships of war, and the Dutch fleet of 90, commanded by *Dr. Ruyter*. There were 21 thousand men nearly on each side and 4,500 pieces of cannon. In that engagement the English lost 23 ships, most of which were burnt or sunk, and the Dutch only 4; but there was scarcely a ship which did not lose her masts in whole or in part. Nine thousand men nearly perished on both sides. The Historians of each Nation as usual exalted the glory of their own fleet up to the skies. One thing is certain, that nine thousand human bodies mutilated and half burnt, given up to sharks and sea-dogs, presented to the monsters of the deep the spectacle of a ferocity which has no example except in the annals of the Human Race; and that this prodigious number of round-tops, sail-yards, and masts, floating about, mixed with flags bearing red crosses and white crosses, must have conveyed some information to the Barbarians of all the Southern regions of the Atlantic Ocean, in what

manner the Powers who pretend to be subjected to the laws of JESUS CHRIST settle their quarrels.*

* These wrecks were undoubtedly carried farther than the Azores. It is probable that at this season a considerable part of them floated as far as the coasts and the western islands of Africa. Now the ground of this quarrel between England and Holland was precisely the African Slave-Trade. Those powers had commenced hostilities the year before on the coasts of Guinea and at the Cape-de-Verd Islands, to the ruin of these Countries. I suppose therefore that those awful monuments of the battle off Ostend, must have passed through the Cape-de-Verd Islands near to that of St. John, which is so little frequented by Europeans that the Portuguese call it *Brava*, or savage. It's good and hospitable inhabitants, according to an English Navigator of the name of *Roberts*, who had a most delightful opportunity of putting these amiable qualities to the test, are so humble, that they look on men of their own colour as subjected by the authority of GOD himself to the yoke of white men. In this opinion they are confirmed by observing the balance of European commerce, one of the beams of which presents to Europe benefits only, while the other, weighed down by calamities, continually presses on wretched Africa.

But when from the summit of their rocks, under the shade of their cotton-trees and of their plantains, they beheld along their peaceful shores this frightful train of masts, yards, galleries, poops, prows, half burnt, stained with human blood, and intermingled with European standards, they then saw the scale loaded with the miseries of Africa rise for a moment, and the other in it's turn sink with an oppressive weight on Europe; and from this re-action of calamity they undoubtedly perceived that an universal Justice governs by equal laws all the Nations of the Globe.

A King of France, it has been said, ordered the bodies of malefactors to be thrown into the river, marked with this dismal inscription: *Let the King's Justice pass.* The Chinese and Japanese punish in the same manner the pirates who infest the navigation of their rivers. Thus the wrecks of these ships of war, which had so often scattered terror over the Atlantic Ocean, were hurried along by it's Currents; and their enormous bulging hulks, blackened by the fire, reddened with human blood, and become a sport to the billows of Africa, spoke much more distinctly than any inscription could to the oppressed inhabitants of those shores: *Behold now, O ye black men! the glory of the Whites, and the Justice of GOD, passing along.*

It would be a calculation worthy, I do not say of our modern Politicians, who no longer set a value on any thing in the World, except gold and power, but of a friend of humanity, to ascertain, Whether the Negro Slave-Trade has not occasioned as many woes to Europe as to Africa; and what are the benefits of which it has been productive to these two divisions of the Globe.

In the first place it would be necessary to take into the account of the calamities of Africa the wars which it's Potentates wage with each other, in order to find a supply of slaves to answer the demand of European traders; the barbarous despotism of it's Sovereigns, who for the attainment of this object deliver up their own subjects; the unnaturally degraded character of their subjects, who, after their example, frequently drag to these inhuman markets their wives and their children; the depopulation of most of the maritime countries of Africa, reduced to a desert by the emigration of their inhabitants, who have been swept away into slavery; the mortality of a very considerable proportion of these wretches, who perish on their passage to America and the West-Indies, by unwholesome food and the scurvy, excessive labour, scantiness of provisions, the merciless whippings and other punishments which they are doomed to endure in our Colonies, and which destroy the greatest part with misery, mortification and despair.

Here undoubtedly is a sad detail of tears and bloodshed on the African side of the account. But it is balanced at least by an equal train of evils on that of Europe: if you state on this side the very navigation of the coast of Africa, the corrupted air of which carries off the seamen of our trading vessels by whole crews at once, as well as the garrisons of our settlements on the coast and up the country, by the dysentery, the scurvy, putrid fevers, and especially by a fever peculiar to the coast of Guinea, which brings the stoutest man to his grave in three days. To these physical evils may be added the moral maladies of Slavery, which destroy in our American Colonies the very first feelings of humanity; because wherever there are slaves, tyrants spring up, together with the influence of this moral depravation upon Europe. Add to the evils of this quarter of the World the resources in the field-employments of America, from which our own commonalty and peasantry are excluded, multitudes of whom are languishing at home in wretchedness for want of employment and of the means of subsistence; the wars which the Slave-trade kindles among the maritime Powers of Europe, their settlements taken and retaken; their naval engagements, which sweep away nine thousand men at a stroke, without reckoning those who are naimed for life; their wars which like a pestilence are communicated to the interior of Europe by their alliances, and to the rest of the World by their commerce; when all these are taken into the statement, it must be allowed that the amount of European evils is a complete balance to those of Africa.

These wrecks scattered over 75 leagues of Sea, came from about twelve miles to the North-West of Ostend, where this naval combat was fought, and were carried as far as the Azores, which *Rennefort's* squadron was leaving when he fell in with them. Ostend is about 51 degrees North, and the Azores about 40, and far to the West.

The first of those wrecks were put in motion from the North-west of Ostend on the 11th of June, which is the date of the beginning of the engagement, conformably to *De Ruyter's* letter and the History of France, and they were found near the Azores by the 20th of the same month at farthest, as must be concluded from the relation of *Rennefort*, though the date of every day in particular is not inserted. The Currents from the North had accordingly wafted them along in nine days more than 275 leagues to the South; without taking into the account the considerable progress which had been made to the westward, on the whole amounting to much more than 34 leagues a day.

It was not the wind sure which hurried those fragments toward the South-West with so much rapidity: the prevailing wind at that season was contrary to them. *Rennefort's* squadron, which had just met them, were sensible of no other wind but that which was carrying them to the North-East; and *De Ruyter* in his dispatches makes mention only of the South-West winds which blew during the engagement. Besides, as has been formerly observed, What hold could the winds have of bodies level with the water? Much less could they have been carried southward by the tides which then set in to the North on our coasts: it must have been therefore a direct Current from the North which carried them to the South even in opposition to the tides, and somewhat to the West by the direction of the Atlantic channel. The Atlantic Current therefore sets in to the South in Summer, notwithstanding the pretended action of the Moon between the Tropics; and it's course at that season can be ascribed only to the melting of the northern polar ices.

These two observations so authentic farther confirm a position elsewhere laid down, that islands are placed at the extremities of currents. *Jinschoten*, who had sojourned at the Azores, remarks that the fragments of most of the shipwrecks suffered in the Atlantic Ocean are thrown upon their coasts. The same thing happens on the shores of the Bermudas, on those of Barbadoes, &c. These floating bodies are wafted to prodigious distances regularly and

As to the balance of benefits, it is reduced on both sides to a very narrow compass. It is impossible with a good conscience to enumerate among the blessings which the inhabitants of Africa derive from the sale of their compatriots, our iron sabres with which they mangle each other, our wretched firelocks, with which they contrive to knock one another on the head, and our ardent spirits which destroy their reason and their health: the whole then is reduced in their favour nearly to a few paltry mirrors and tinkling bells.

With respect to the benefits derived from this trade to Europe, there is sugar, coffee, and cotton, with which America and its Islands supply us by means of the labour of negro slaves; but these rude and formless productions can stand no manner of comparison with the perfected manufactures and the crops of every kind which might be derived from the same fields by free, happy, and intelligent European cultivators.

It appears to me that if this balance of evils so oppressive and of benefits so trivial were presented to the maritime and Christian Powers of Europe, they would discover at length that it is not sufficient to have banished Slavery from their own territories in order to render their subjects industrious and happy; but that they must likewise proscribe it in their Colonies for the sake of these very subjects themselves, for that of the Human Race, and for the glory of their Religion.

alternately as the Currents of the Ocean themselves are. The seeds of the islands of Jamaica are accordingly conveyed in Winter as far as the Orkneys, that is more than 1060 leagues from South to North, and a distance of more than 1800 leagues by the flux of the South Pole; and beyond a doubt the fluviatic seeds of the Orkneys are carried along in Summer to the shores of Jamaica by the flux of the North Pole.

The self-same correspondencies must subsist between the vegetables of Holland and of the Azores. I am not acquainted with any of the seeds peculiar to the rivers of Jamaica; but I am absolutely certain that they possess the nautical characters which I have observed in those of all fluviatic plants. Here then is a new confirmation of the vegetable harmonies of Nature founded on the emigration of plants. It may be likewise applied to the emigration of fishes, which pursue such long and winding directions through the open Sea, guided unquestionably by the floating seeds of fluviatic plants, for which they have in all countries a decided preference of taste, and which Nature produces on the banks of rivers particularly, with a view to their nourishment.

It appears to me possible for Mankind, by means of the alternate Currents of the Ocean, to maintain a regular mutual correspondence free of all expense over all the maritime countries of the Globe. It might perhaps be possible by these means to turn to very good account those vast forests which cover the northern districts of Europe and of America, consisting mostly of fir, and which rot on the face of those deserted lands, without producing any benefit to Man. They might be committed in Summer in well-compacted floats, first to the current of the rivers, and afterward to that of the Ocean, which would convey them at least to the Latitude of our coasts which are stripped of planting, as the course of the Rhine pours every year into Holland prodigious rafts of oak felled in the forests of Germany. The wrecks of the naval engagement off Ostend, conveyed with such rapidity as far as the Azores, discover in some degree the extent of the resources which Nature offers to supply in this way.

Geography might likewise make this a source of many future useful and important discoveries. To the effect of those Currents is *Christopher Columbus* indebted for the discovery of America. A simple reed of foreign growth thrown on the western coasts of the Azores suggested to that great Man the probability of the existence of another Continent to the West. He farther thought of availing himself of the Currents of the Ocean on his return from his first voyage to America; for, being in imminent danger of perishing in a storm amidst the Atlantic Ocean, without having it in his power to inform Europe, which had so long slighted his services and derided his enlightened theory, that he had actually at length found out a New World, he inclosed the History of his discovery in a cask, which he committed to the waves, confident that sooner or later it would reach some shore.

A common glass bottle might preserve such a deposit for ages on the surface of the Deep, and waft it repeatedly from Pole to Pole. It is not for the sake of our haughty and unfeeling Academicians, who refuse to see any thing in Nature which they have not imagined in their closet, it is not for them that I thus dwell on the detail and the application of these oceanic harmonies; no, it is for your sake, unfortunate mariners! It is from the mitigation of the

woes to which your profession exposes you that I one day expect my noblest and most durable recompense. One day, perhaps, a wretched individual of your description, shipwrecked on a desert island, may intrust to the Currents of the Seas the sad task of announcing to the habitations of Men the news of his disaster, and of imploring assistance. Some Ceyx, perhaps, perishing amidst the tempests of Cape Horn, may charge them to waft his expiring farewell; and the billows of the Southern Hemisphere may speed the tender sigh to the shores of Europe, to soothe the anguish of some future Alcyone.

After the facts which I have just detailed, it is no longer possible to doubt that the Indian and Atlantic Oceans have their sources in the half-yearly and alternate fusions of the ices of the South and North Poles, as they have half-yearly and alternate Currents perfectly corresponding to the Summer and Winter of each Pole. These Currents, it may well be believed, flow with much greater velocity than the floating bodies on their surface. There is produced at the Equinoxes a retrogressive impulsion in the whole mass of their waters at once, as appears at those eras from the universal agitation of the Ocean in all Latitudes. This total and almost instantaneous subversion cannot possibly be produced by the operation of the Moon and of the Sun, which proceed always in one direction and are constantly confined within the Tropics: but, as I have again and again repeated, it is produced by the heat of the Sun, which then passes almost instantaneously from the one Pole to the other, melts the frozen Ocean which covers it, communicates by the effusion of it's ices new sources to the fluid Ocean, opposite directions to it's currents, and inverts the preceding preponderancy of it's waters.

Much less is it possible to deduce, as has been done, the cause of the tides from the action of the Sun and of the Moon upon the Equator; for if this were so, they must be much more considerable between the Tropics near to the focus of their movements than any where else; but this is by no means the case. Hear what *Dumpier* says respecting the tides on the coasts of India near the Equator, in his *Treatise on the Winds*, page 378.

“From Cape Blanc on the coasts of the South-Sea, from the third to the “thirtieth degree of South Latitude, the flux and reflux of the Sea is only a “foot and a half, or at most two feet.....The tides in the East-Indies rise very “little, and are not so regular as with us, that is in Europe :.....They rise,” says he in another place, “to four, or at most five feet.” He afterwards informs us that the highest tide which he ever observed on the coast of New Holland did not take place till three days after the full or new Moon.

The weakness and the very considerable retardation of these Tides between the Tropics evidently demonstrate therefore, that the focus of their movements is not under the Equator; for if it were so, the tides would be tremendous on the coasts of India which are in it's vicinity, and parallel to it: but their origin is near the Poles, where they rise in fact from twenty to twenty-five feet near Magellan's Strait, according to Sir *John Nurborough*, and to a height equally considerable at the entrance of Hudson's Bay, if we may believe *Ellis*.

Let us make a brief recapitulation. The tides are the half-daily effusions of the ices of one of the Poles, just as the general Currents of the Ocean are it's half-yearly effusions. There are two general opposite Currents annually, because the Sun warms by turns in the course of one year the southern and

northern Hemispheres ; and there are two tides every day, because the Sun warms by turns every twenty-four hours the eastern and the western side of the Pole that is in fusion. The same effect exactly is visible in many lakes situated in the vicinity of icy mountains, which have currents and a flux and reflux in the day-time only. But it cannot admit of doubt, that if the Sun warmed during the night the other side of those mountains, they would produce likewise another flux and reflux in their lakes, and consequently two tides in twenty-four hours as in the Ocean.

The retardation of the tides of the Ocean, which is about twenty-four minutes the one from the other, arises from the daily diminution of the diameter of the icy cupola of the Pole in fusion. Accordingly the focus of the tides is removing farther and farther from our coasts. If their intensity is such, according to *Bouguer*, that our evening tides are the strongest in Summer, it is because they are the diurnal effusions of our Pole, produced by the heat of the day in the sultry season. If at that season they are less strong in the morning than in the evening, it is because they are the nocturnal effusions which come from the other part of the Pole, and discharge themselves into the sources in the spiral direction of the Atlantic Ocean, but in a smaller quantity.

If, on the contrary, at the end of six months the strongest tides, that is those of the evening become the weakest ; and the weakest, that is those of the morning, become the strongest ; it is because they are then produced by the action of the Sun on the South Pole, and the cause being opposite the effects must be so likewise. If the tides are stronger one day and a half, or two days after the full Moon, it is because that Luminary increases by her heat the polar effusions, and consequently the quantity of water in the Ocean. The Moon possesses a degree of heat which not only evaporates water, as was ascertained by recent experiments at Rome and at Paris, but which melts the ices, as *Pliny* relates, in conformity to the observations of Antiquity. "The Moon produces thaw, resolving all ices and frosts by the humidity of her influence." *Natural History*, Book ii. chap. 101. Finally, if the tides are more considerable at the Equinoxes than at the Solstices, it is because, as has been observed, at the Equinoxes there is the greatest possible mass of water in the Ocean, for the greatest part of the ices of one of the Poles is then melted, and those of the opposite Pole then begin to dissolve.

We are not to imagine that every tide is a polar effusion of the particular day when it happens ; but it is an effect of that series of polar effusions which perpetually succeed to each other ; so that the tide which takes place to-day on our coasts, is perhaps part of that which takes place it may be for six weeks together ; and it's motion is kept up by those which flow every day in it's series. Thus in a row of balls placed on a billiard table, the first which receives an impulsion communicates it to the next, and that one to the following, and so through the whole series, and the last only is detached from the row by what remains of the moving force. But here too we must admire that other harmony which pervades the most remote effects of Nature : it is this, that the evening and morning tides take place on our coasts, as if they issued that very day from the higher and lower part of our Hemisphere ; and that the tides of Summer are precisely opposite to those of Winter, as the Poles themselves from which they flow.

I could support this new theory by a multitude of facts, and apply it to most of the nautical phenomena which have hitherto been deemed inexplicable, but the time and the space left me forbid it. It is sufficient for me to have deduced from it the principal movements of the Seas. I was under the necessity of tracing the windings of this labyrinth with an application and labour of which the Reader cannot easily form an idea. I have shewn him it's entrance and outlet, and present him with the clew. He will be able undoubtedly to go much farther without my assistance. I can venture to assure him that, by taking advantage of these principles, in perusing journals and Sea voyages that pretend to any thing like exactness in dates and observations, such as those of *Abel Tasman*, of *Hugues*, of *Linschoten*, of General *Beaulieu*, of *Froger*, of *Fraser*, of *Dampier*, of *Ellis*, &c. he will find a new light diffused over those passages of marine journals, which are for the most part so dry and so obscure.

Had time and means been granted me to unfold this part of my subject, and to display it in all the luminous simplicity of which it is susceptible, I have the vanity to think that I could have rendered it in many other respects highly interesting. I would have procured a representation on two large solid globes of the two general Currents of the Ocean in Winter and in Summer, with arrows which should have expressed the exact intervals between one tide and another: and of their counter-currents, lateral to the passage of all straits, which produce on different shores the counter-tides, half-daily, daily, weekly, lunar, and half-yearly. These counter-tides should have produced others on the return at the passage of islands; so that the Ocean would have been represented as a vast fluid issuing from each Pole to make the circuit of the Globe, and forming on it's shores a multitude of counter-currents and counter-tides, all dependant on the effusions of one Pole singly. I should have employed for this purpose the best authenticated marine Journals.

It would then have been evidently clear that the bays of Continents and even of islands are sheltered from the general Currents; and I would have demonstrated, on the contrary, that the course and the direction of all rivers are adapted to those Currents and those tides of the Ocean, in order to accelerate them in certain places and to retard them in others, just as the course of brooks and rivulets is itself adapted to the current of rivers, and for the same end.

I would have done more; in order to vindicate Geography from the charge of dryness, and to unite the graces which all the Kingdoms of Nature communicate to each other, instead of arrows I should have illustrated my subject by figures more analogous to those Seas, and have added new proofs to the theory of those polar effusions, by a representation of several species of fishes of passage, which at certain seasons of the year resign themselves to their currents, in order to pass from the one Hemisphere to the other.

This much is certain, that the principal point of their union, as well from the one Pole as from the other, precisely is at the strait formed by Guinea and Brasil, where, as has been said, are formed those two great lateral counter-currents which return toward the Poles. There is the rendezvous of the fishes from the North Pole, and from the South. Herrings, whales, and mackerel, are in Summer found in great abundance on those shores. The

whales of the North have formerly been so common at Brasil, that, according to the report of Navigators, the fishery on it's coasts was farmed out, and produced a considerable revenue to the King of Portugal. I know not how it may be at present: perhaps the noise of European artillery may have chased them away from those coasts. A very productive cod-fishery was likewise carried on there, known all over America by the name of the Brasil cod.

On the other hand, according to the testimony of *Bosman*, a Dutch Navigator, who has published a very good account of Guinea, the whales of that species which is called *North-caper* are found in great abundance on the coasts of Guinea. He alleges that they resort thither to bring forth their young: *Artus* has favoured us with a catalogue of the fishes of passage which appear on that coast during the different months of the year. Though it is very imperfect, we are enabled by it to distinguish the fishes which are peculiar to each Pole. In the months of April and May it is a species of ray which rises to the surface of the water; in June and July a sort of herring, in such quantities that the Negroes, on throwing among them a simple leaden weight at the extremity of a long line furnished with hooks, always draw up a considerable number at every throw. During the same months they catch a great many lobsters, similar, says *Artus*, to those of Norway.

In September innumerable legions and various species of mackerel arrive there. At that season too appears a kind a mullet, which, unlike all other fishes, who delight in silence, flock to noise. The Negroes avail themselves of this instinct as a means of catching them. They tie to a piece of wood surrounded with hooks a sort of cornet with it's clapper; thus furnished it is thrown into the sea; and the motion of the waves tossing about the cornet produces a certain noise, which attracts the fish in question, so that in attempting to lay hold of the piece of wood, they are themselves caught. Kind Nature accordingly thus furnishes to the poor Negroes a fishery adapted to their capacity and industry.

This species of mullet appears from it's instinct destined to travel through turbulent seas and at noisy seasons, for he is visible only about the autumnal Equinox at the revolution of the seasons. But in the months of October and November those shores are crowded with fishes whose names and manners are unknown to Europe, and which seem to appertain to the South Pole, whose Currents are then in a state of activity. Such are a sea-pike or jack, the teeth of which are extremely sharp and the bite very dangerous: a species of salmon with white flesh and of an exquisite flavour: another called the star of the sea, a species of sea-dog, which has a very large head and throat in form of a warming-pan; it is marked on the back with a cross: some of them grow to such a size, that a single one is sufficient to load two or three canoes. In December arrive vast quantities of the korkofedo or moon-fish; they appear likewise in June. The korkofedo seems to regulate his progress by the solstices. He is as broad as long, and is caught by a bit of sugar-cane fixed on a hook. The appetite which this fish has for the sugar-cane is another proof of the harmonies established between fishes and vegetables. Finally, in the months of January, February, and March, may be seen on the coast of Guinea a species of small fish, with large eyes, which *Artus* supposes to be the *oculus*, or *piscis oculatus* (eyed-fish) of *Pliny*. This too is an inhabitant of the

boisterous equinoctial Seas, for he frisks and jumps about with a great deal of noise.

Had time permitted I would have extended these elementary concords to the different inhabitants of the departments of the Ocean. We should have seen, for example, the cause of the alternate transition of turtles, which for six months of the year take up their abode in certain islands, and which are found again six months after in other islands, seven or eight hundred leagues distant, putting it beyond the power of imagination to conceive how an amphibious animal so sluggish and unwieldy should be able to make a passage so immense toward places which it is impossible she should perceive. We should have seen their heavy-sailing squadrons committing themselves almost without motion in the night time, to the general Current of the Ocean, coasting by moon-light the gloomy promontories of Islands, and seeking in their deserted creeks some sandy and tranquil bank, where far from din they may undisturbedly deposit their eggs.

Others, such as the mackerel, never fail to arrive at the accustomed season on other shores, conveyed by the same currents, because then they are blind. "When the mackerel come to the coasts of Canada," says *Denis*, formerly Governor of that country, "they have not the least glimmering of sight. They have a speck on their eyes which does not fall off till toward the end of June; thenceforward they see and are caught by the line."* His testimony is confirmed by other Navigators, though there was no necessity for it.

Other fishes, such as herrings, expose their silvery legions to glitter in the Sun on the northern strands of Europe and America, shaded with firs, and advance forward and forward till they reach even the palm groves of the Line, forcing their way along the shores, in opposition to the tides of the South, which are continually supplying them with fresh pasture.

Others, as the thunny, make their way by favour of those very tides, and enter in the Spring into the Mediterranean, of which they make a complete circuit; and though they leave no trace on their watery way, they do not fail to render themselves visible in the darkest night, by means of the phosphoric lights which their motion excites. It is by those same gleams of light that we perceive in the night-time the turtle with their dusky colour on the surface of the waters. You would imagine that these animals, surrounded by light, had flambeaus affixed to their fins and tails. The phosphoric qualities accordingly of the sea-water are in unison even with the nocturnal voyages of fishes.

The Sun is the grand mover in all these harmonies. Arrived at the Equinox, he abandons one Pole to Winter, and gives to the other the signal of Spring, by the fires with which he environs it. The heated Pole pours out in every direction torrents of water and of melted ices into the Ocean, to which it supplies new sources. The Ocean then changes its course; it draws into its general Current most of the fishes of the North toward the South; and by its lateral counter-currents, those of the South toward the North. It attracts others even from the Continent, by the alluvions of the land which the rivers discharge; such are the fishes with scales, as salmon, which love, in general, to make their way upward against the course of rivers.

These floating legions are attended by innumerable cohorts of sea-fowls, which quit their natural climates, and hover around the fishes, to live at their expense. It is then that we find the sea-fowls of the South flocking to the shores of the North, as the pelican, the flamingo, the heron, the stork ; and those of the North finding their way to the South, as the lomb, the burgo-master, the cormorant. It is then that sands and shallows the most deserted, are crowded with inhabitants, and that Nature presents new harmonies on every shore.

If the voyages of the inhabitants of the Seas would have diffused new light on the Currents of the Ocean, these same Currents would have furnished us with new light respecting the forms and manners of fishes, which have to us such an uncouth appearance. Most of these fishes cast their spawn in such abundance, that the Sea is frequently covered by it for several leagues together. The currents carry off this spawn to prodigious distances ; and while the fathers and mothers unconcernedly indulge in the dalliance of love on the coast of Norway, their fry are hatching on those of Africa or Brasil.

We should have seen these categories so wonderfully varied, of a configuration perfectly adapted to the different sites of the Ocean : some cut out into long sword-blades, like the African fish which bears that name, take pleasure in penetrating into the narrowest crevices of rocks, and in stemming the most rapid currents : others, equally flat, are cut into a circular form, with two long horns like sail-yards, issuing from the head, and inverted behind, to serve them as a helm, as the silvery moon-fish of the Antilles. These moon-fish are continually sporting among the billows which break upon the rocks, without a single instance being known of any one thrown ashore. Other fishes of a triangular shape, and cut into the form of the chest whose name they bear, advance into the very middle of the shelvy ground upon the shore, where there is scarcely any water, and display in the bosom of the dusky rocks, their blue shining robes, bespangled with stars of gold.

While some, perpetually restless, scratch and scrape into every chink along the beach in quest of their prey ; others, in perfect tranquillity respecting their provision, remain immovable on a fixed station expecting it. Some, incrustated in lumpish habitations of stone, pave the ground of the shores, as the *helmet*, the *lamby*, and the *thuilée* ; others, attached by threads to little pebbles, ride at anchor at the mouths of rivers, as the muscle ; others glew themselves to each other, as the oyster ; others fix themselves as the heads of nails to the rock, to which they cling by suction, as the *limpit* ; others bury themselves in the sand, as the *harpe*, the cockle, the knife-handle ; and most of the shell-fish whose exterior garments are clear and brilliant ; others, as the lobster and the crab, armed with bucklers and corslets, lie in ambush among the stones, where they present to view only the extremities of their horns and their great claws.

Had it been in my power, I would have studied the contrasts which those innumerable families form on the slime, and on the rocks, where their shells sparkle with the fires of *Aurora*, and with the lustre of purple and of the *lapis-lazuli*. I would have described those sea-coloured regions, clothed with plants of an infinite variety of forms, which never receive the rays of the sun but through the medium of water. Their very valleys, where the currents gush with the rapidity of sluices, produce plants, elastic and perforated, such

as the leaves of the sea-peacock, through the apertures of which the waves pass as through a sieve. I would have represented their rocks, rising from the depth of the abyss, like mounds incapable of being moved, with cavernous sides, presenting bristly beds of madrépores, and festooned with moveable garlands of *fucus*, *alga-marina*, and other sea-weeds of all colours, which serve as shelter and bedding for the calves and horses of the Sea.

During storms, their dark bases are covered with clouds of a phosphoric light; and sounds unutterable, issuing from their untraceable mazes, invite to the prey the silent legions of the inhabitants of the mighty deep. I would have endeavoured to force my way into those palaces of the Nereids, in order to unveil mysteries hitherto concealed from the human eye, and to contemplate, from afar, the footsteps of that infinite WISDOM which are impressed on the oozy bottom of the Ocean. But researches so laborious, though so delightful, of such importance to our fisheries, and so fertile of materials for Natural History, far transcend the fortunes and the exertions of a Solitary.

I have the confidence, however, to flatter myself with the belief, that the new Theory which I have presented, respecting the causes of the general Currents, and of the Tides of the Ocean, may be rendered useful to Navigation. It appears to me, that a vessel taking her departure hence, in the month of March, with the course of our polar effusions, and keeping in the middle of the Atlantic channel, might proceed in Summer all the way to the East-Indies, continually favoured by the current. This I am able even to prove, by the experience of various Navigators. It is true that during the season which is the Winter of the South Pole, the weathering of the Cape is dangerous, because the westerly monsoon, which then predominates in those Seas, excites in them frequent storms, as well as on the coasts of India, which are opposed to it; but I believe these inconveniencies might be avoided, by stretching out into a higher Latitude.

The same vessel might return from the East-Indies six months afterwards during our Winter, aided by the effusions of the South Pole. Advantage might be taken on the contrary of the counter-currents of the general Currents, or of their lateral Tides to go or return at the intermediate seasons, by coasting along the Continents. It is easy to deduce from this Theory, other means of information for the Navigation of all Seas; for example, assistance might be derived from those currents for the discovery of new islands; for every island is situated at the extremity, or at the confluence of one or more currents, as every volcano is placed in a counter-tide.

Here I close these nautical disquisitions, in which there are undoubtedly, inaccuracies of style, and manifold imperfections of various kinds; but determined by particular circumstances to bring this Work, without delay, before the tribunal of the Public, I have hastened to present my Country with this last testimony of my attachment. I reckon on the indulgence of the really intelligent, and presume to hope they will have the goodness to rectify my mistakes.

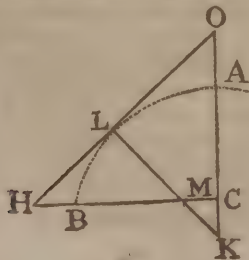
NOTE RESPECTING THE FIGURE OF THE EARTH.

(See Page xxii.)

Furnished the Editor by Mr. Joseph Clay.

The error of Mr. *Saint-Pierre* arises from his supposing that the degrees of Latitude are measured by the angles formed at the centre of the earth by the semi-diameters of the meridian. This is not the case, the only mode of determining the Latitude is by observing *at the surface of the earth* the altitudes of the heavenly bodies either by means of double reflection as in *Godfrey's Octant*, or as it is commonly called *Hadley's Quadrant*, or by means of gravitating lines as in the mural Quadrant and Sectors.

The Latitude is computed from the angle made by a ray of light coming from the body observed, in the first case with a tangent to the meridian, and in the second with the line of direction in which a heavy body is attracted towards the earth. It is easily shewn that in the first instance the difference of the Latitude between two places on the same meridian is accurately measured by the angle formed by the perpendiculars to the two horizons, or what is the same thing, by the perpendiculars to the tangent to the meridian drawn through the two places. And it is demonstrated (*vide Mac Laurin's Fluxions*, vol. ii. art. 637. London Edition, 1801,) that the line of direction in which a heavy body, influenced both by the centrifugal and centripetal forces, gravitates to a spheroid is perpendicular to the surface of the spheroid, and consequently to a tangent to the generating ellipsis. The Latitude found in the latter case will therefore be precisely the same as in the former, and the difference of Latitude will in the same manner be measured by the angle formed by the perpendiculars to the tangents to the meridian, which is equal to the difference of the observed altitudes: This agrees with all the observations made at Greenwich and elsewhere. It follows that the nearer the curve of a meridian approaches to a right line the longer must be the part of the arch which subtends a given angle, for if the earth were a plane the perpendiculars would be parallel, and no other difference would be found in the altitudes of the same body observed at the same time, than that arising from the difference of parallax. And of course the nearer the earth approaches to a plane, the less will be the difference of altitude observed by two persons on the same meridian at any given distance from each other; and consequently the degrees of Latitude must be longer as the earth is flatter. Independently of this consideration it is shewn by calculation that if a tangent be drawn to an ellipsis making an angle of forty-five degrees with each axis (*see figure.*)



If the arch AL is longer than the arch LB , BC is greater than AC ; and if AC represent the semi-axis of the earth and BC the equatorial semi-diameter, LK a perpendicular to the tangent will form angles LKO , LMH equal to 45 degrees, with AC and BC ; L will therefore represent a place in the Latitude of 45 degrees. Now it is found by actual measurement that, each degree of the arch AL is greater than a degree of the arch BL , consequently the whole arch AL is greater than the whole arch BL ; BC is consequently greater than AC , and the Earth is an oblate Spheroid, (see Amer. Phil. Trans. vol. V. No. XXII.)

This is further confirmed, if it wanted confirmation, from analogy, the same being the case with the other planets.

STUDIES OF NATURE.

STUDY FIRST.

IMMENSITY OF NATURE : PLAN OF MY WORK.

SOME years have elapsed, since I formed the design of composing a general History of Nature, in imitation of *Aristotle*, *Pliny*, Chancellor *Bacon*, and several illustrious modern Authors. The field appeared to me so vast, that I could not believe the possibility of it's being entirely pre-occupied. Besides, Nature invites to the cultivation of herself, persons of every age and country; and if she promises the golden harvest of discovery, only to men of genius, she reserves some gleanings at least, for the simple and unlearned; for such, especially, as, like myself, are making a pause every step they advance, transported at the beauty of her divine productions.

I was farther prompted to the execution of my great design, in the view of rendering an acceptable service to my fellow-creatures, and of meriting their approbation; particularly that of *Louis* the XVI. my illustrious benefactor, who, after the example of *Titus*, and of *Marcus-Aurelius*, devotes his whole attention to the felicity of mankind.

In Nature herself alone, we must expect to find the laws of Nature; and we plunge into difficulty and distress, only in proportion as we deviate from those laws. To study Nature, therefore, is to act the part of a good subject, and of a friend to humanity. I have employed, in my researches, all the powers of reasoning I possess; and, though my means may have been slender, I can say, with truth, that I have not permitted a single day to pass, without picking up some agreeable, or useful observation.

I proposed to begin the composition of my Work, when I had ceased from observing, and when I should have collected all the materials necessary to a History of Nature ; but I found myself in the condition of the child, who, with a shell, had dug a hole in the sand, to hold the water of the Ocean.

Nature is of unbounded extent, and I am a human being, limited on every side. Not only her general History, but that of the smallest plant, far transcends my highest powers. Permit me to relate, on what occasion I became sensible of this.

One day, in Summer, while I was busied in the arrangement of some observations which I had made, respecting the harmonies discoverable in this Globe of our's, I perceived, on a strawberry plant, which had been accidentally placed in my window, some small winged insects, so very beautiful that I took a fancy to describe them. Next day, a different sort appeared, which I proceeded, likewise, to describe. In the course of three weeks, no less than thirty-seven species, totally distinct, had visited my strawberry plant: at length, they came in such crowds, and presented such variety, that I was constrained to relinquish this study, though highly amusing, for want of leisure, and, to acknowledge the truth, for want of expression.

The insects, which I had observed, where all distinguishable from each other, by their colours, their forms, and their motions. Some of them shone like gold, others were of the colour of silver, and of brass? some were spotted, some striped; they were blue, green, brown, chesnut-coloured. The heads of some were rounded like a turban, those of others were drawn out into the figure of a cone. Here it was dark as a tuft of black velvet, there it sparkled like a ruby.

There was not less diversity in their wings. In some they were long and brilliant, like transparent plates of mother-of-pearl; in others, short and broad, resembling net-work of the finest gauze. Each had his particular manner of disposing and managing his wings. Some disposed theirs perpendicularly; others, horizontally; and they seemed to take pleasure in displaying them. Some flew spirally, after the manner of butterflies; others sprung into the air, directing their flight in opposition to the wind, by a mechanism somewhat similar to that

of a paper-kite, which in rising, forms, with the axis of the wind, an angle, I think of twenty-two degrees and an half.

Some alighted on the plant to deposit their eggs; others, merely to shelter themselves from the Sun. But the greatest part paid this visit from reasons totally unknown to me: for some went and came, in an incessant motion, while others moved only the hinder part of their body. A great many of them remained entirely motionless, and were like me, perhaps, employed in making observations.

I scorned to pay any attention, as being already sufficiently known, to all the other tribes of insects, which my strawberry plant had attracted; such as the snail, which nestles under the leaves; the butterfly, which flutters around; the beetle, which digs about its roots; the small worm, which contrives to live in the *parenchyme*, that is, in the mere thickness of a leaf; the wasp and honey-bee, which hum around the blossoms; the gnat, which sucks the juices of the stem; the ant, which licks up the gnat; and, to make no longer an enumeration, the spider, which, in order to find a prey in these, one after another, distends his snares over the whole vicinity.

However minute these objects may be, they surely merited my attention, as Nature deemed them not unworthy of her's. Could I refuse them a place in my general History, when she had given them one in the system of the Universe? For a still stronger reason, had I written the history of my strawberry plant, I must have given some account of the insects attached to it. Plants are the habitation of insects; and it is impossible to give the history of a city, without saying something of it's inhabitants.

Besides, my strawberry plant was not in it's natural situation, in the open country, on the border of a wood, or by the brink of a rivulet, where it could have been frequented by many other species of living creatures. It was confined to an earthen pot, amidst the smoke of Paris. I observed it only at vacant moments. I knew nothing of the insects which visited it during the course of the day; still less of those which might come only in the night, attracted by simple emanations, or, perhaps, by a phosphoric light, which escapes our senses. I was totally ignorant of the various species which might frequent it, at other seasons of the year, and of the endless other relations which it

might have, with reptiles, with amphibious animals, fishes, birds, quadrupeds, and, above all, with Man, who undervalues every thing which he cannot convert to his own use.

But it was not sufficient to observe it, from the heights of my greatness, if I may use the expression; for, in this case, my knowledge would have been greatly inferior to that of one of the insects, who made it their habitation. Not one of them, on examining it with his little spherical eyes, but must have distinguished an infinite variety of objects, which I could not perceive without the assistance of a microscope, and after much laborious research. Nay, their eyes are inconceivably superior even to this instrument; for it shews us the objects only which are in it's focus, that is, at the distance of a few lines; whereas they perceive, by a mechanism of which we have no conception, those which are near, and those which are far off. Their eyes, therefore, are at once microscopes and telescopes. Besides, by their circular disposition round the head, they have the advantage of viewing the whole circuit of the heavens at the same instant, while those of the Astronomer can take in, at most, but the half. My winged insects, accordingly, must discern in the strawberry plant, at a single glance, an arrangement and combination of parts, which, assisted by the microscope, I can observe only separate from each other, and in succession.

On examining the leaves of this vegetable, with the aid of a lens which had but a small magnifying power, I found them divided into compartments, hedged round with bristles, separated by canals, and strewed with glands. These compartments appeared to me similar to large verdant inclosures, their bristles to vegetables of a particular order; of which some were upright, some inclined, some forked, some hollowed into tubes, from the extremity of which a fluid distilled; and their canals, as well as their glands, seemed full of a brilliant liquor. In plants of a different species, these bristles, and these canals, exhibit forms, colours, and fluids, entirely different. There are even glands, which resemble basons, round, square, or radiated.

Now, Nature, has made nothing in vain. Wherever She has prepared a habitation, She immediately peoples it. She is never straitened for want of room. She has placed animals, furnished with fins, in a single drop of water, and in such multitudes, that *Leewenhæk*, the natural Philosopher, reckoned up to thousands

of them. Many others after him, and, among the rest, *Robert Hook*, have seen, in one drop of water, as small as a grain of millet, some 10, others 30, and some as far as 45 thousand. Those who know not how far the patience and sagacity of an Observer can go, might, perhaps, call in question the accuracy of these observations, if *Lyonnet*, who relates them in *Lesser's* Theology of Insects,* had not demonstrated the possibility of it, by a piece of mechanism abundantly simple. We are certain, at least, of the existence of those beings whose different figures have actually been drawn. Others are found, whose feet are armed with claws, on the body of the fly, and even on that of the flea.

It is credible, then, from analogy, that there are animals feeding on the leaves of plants, like the cattle in our meadows, and on our mountains; which repose under the shade of a down imperceptible to the naked eye, and which, from goblets formed like so many suns, quaff nectar of the colour of gold and silver. Each part of the flower must present to them, a spectacle of which we can form no idea. The yellow *antheræ*† of flowers, suspended by fillets of white, exhibit to their eyes, double rafters of gold in equilibrio, on pillars fairer than ivory; the *corolla*, an arch of unbounded magnitude, embellished with the ruby and the topaz; rivers of nectar and honey; the other parts of the floweret, cups, urns, pavilions, domes, which the human Architect and Goldsmith have not yet learned to imitate.

I do not speak thus from conjecture: for having examined, one day, by the microscope, the flowers of thyme, I distin-

* Book II. See the last note.

† Wherever Saint-Pierre adopts the Latin words *anthera*, *anther*, I would prefer the words *anthers*, *anther*, as being at least equally elegant, and more agreeable to the genius of the English language. In like manner, I prefer *pistil*, and *pistils*, to *pistillum*, and *pistilla*. But not being the translator of the STUDIES, I do not make any change in this part of the author's text. Indeed, with the text, I have taken no liberty whatever, except in two or three instances, where I have made a slight alteration in the names of some of the plants. Thus I have changed *magnolium* to *magnolia*, by which appellation it is known in all the books of botany. In regard to the word "fillets," it would be better to read "filaments." This word, formed from the Latin *filamentum*, a thread, is now adopted in the English books of botany, and even begins to be used in familiar conversation —B S B

guished in them, with equal surprize and delight, superb flagons, with a long neck, of a substance resembling amethyst, from the gullets of which seemed to flow ingots of liquid gold. I have never made observation of the *corolla* simply, of the smallest flower, without finding it composed of an admirable substance, half transparent, studded with brilliants, and shining in the most lively colours.

The beings which live under a reflex thus enriched, must have ideas, very different from ours, of light, and of the other phenomena of Nature. A drop of dew, filtering in the capillary and transparent tubes of a plant, presents to them, thousands of cascades; the same drop, fixed as a wave on the extremity of one of its prickles, an Ocean without a shore; evaporated into air, a vast aerial Sea. They must, therefore, see fluids ascending, instead of falling; assuming a globular form, instead of sinking to a level; and mounting into the air, instead of obeying the power of gravity.

Their ignorance must be as wonderful as their knowledge. As they have a thorough acquaintance with the harmony of only the minutest objects, that of vast objects must escape them. They know not, undoubtedly, that there are men, and, among these, learned men, who know every thing, who can explain every thing, who, transient like themselves, plunge into an infinity on the ascending scale, in which they are lost; whereas they, in virtue of their littleness, are acquainted with an opposite infinity, in the last divisions of time and matter.

In these ephemeral beings, we must find the youth of a single morning, and the decrepitude of one day. If they possess historical monuments, they must have their months, years, ages, epochs, proportioned to the duration of a flower; they must have a chronology different from ours, as their hydraulics and optics must differ. Thus, in proportion as Man brings the elements of Nature near him, the principles of his Science disappear.

Such, therefore, must have been my strawberry plant, and it's natural inhabitants, in the eyes of my winged insects, which had alighted to visit it; but supposing I had been able to acquire, with them, an intimate knowledge of this new world, I was still very far from having the history of it. I must have, previously, studied it's relations to the other parts of Nature :

to the Sun, which expands it's blossom, to the winds which sow it's seeds over and over, to the brooks whose banks it forms and embellishes. I must have known, how it was preserved in Winter, during a cold capable of cleaving stones asunder; and how it should appear verdant in the Spring, without any pains employed to preserve it from the frost; how, feeble and crawling along the ground, it should be able to find it's way from the deepest valley, to the summit of the Alps, to traverse the Globe from north to south, from mountain to mountain, forming, on it's passage, a thousand charming pieces of chequered work, of it's fair flowers, and rose-coloured fruit, with the plants of every other climate; how it has been able to scatter itself from the mountains of Cachemire to Archangel, and from the *Felices*, in Norway, or Kamschatka; how, in a word, we find it in equal abundance, in both American Continents, though an infinite number of animals is making incessant and universal war upon it, and no gardener is at the trouble to sow it again.*

Supposing all this knowledge acquired, I should still have arrived no farther than at the history of the *genus*, and not that of the *species*. The varieties would still have remained unknown, which have each it's particular character, according as they have flowers single, in pairs, or disposed in clusters; according to the colour, the smell, and the taste of the fruit; according to the size, the figure, the edging, the smoothness, or the downy clothing of their leaves. One of our most celebrated botanists, *Sebastian le Vaillant*,† has found, in the environs of Paris alone, five distinct species, three of which bear flowers, without producing fruit. In our gardens, we cultivate at least twelve different sorts of foreign strawberries; that of Chili, of Peru; the Alpine, or perpetual; the Swedish, which is green, &c. But how many varieties are there, to us totally unknown!

* It has, until of late, been very generally supposed, that the strawberry of North-America is the same as that of the old continent: but it is now believed, that they are specifically different. The American species is called by Michaux, in his *Flora*, *fragaria Canadensis*. I have called it *fragaria Americana*. There is no reason to suppose, that these two plants are merely physical varieties.—B. S. B.

† Author of *Botanicon Parisiense*.

Has not every degree of latitude a species peculiar to itself? Is it not presumable, that there may be trees which produce strawberries, as there are those which bear pease and French-beans? May we not even consider as varieties of the strawberry, the numerous species of the raspberry, and of the bramble, with which it has a very striking analogy, from the shape of it's leaves; from it's shoots, which creep along the ground, and replant themselves; from the rose form of it's flowers, and that of its fruit; the seeds of which are on the outside? Has it not, besides, an affinity with the eglantine and the rose-tree, as to the flower; with the mulberry, as to the fruit; and with the trefoil itself, as to the leaves; one species of which, common in the environs of Paris, bears, likewise, it's seeds aggregated into the form of a strawberry, from which it derives the botanic name of *trifolium fragiferum*, the strawberry-bearing trefoil? Now, if we reflect, that all these species, varieties, analogies, affinities, have, in every particular latitude, necessary relations with a multitude of animals, and that these relations are altogether unknown to us, we shall find, that a complete History of the strawberry plant, would be ample employment for all the Naturalists in the world.

What a task then, would it be, to write the History, in like manner, of all the species of vegetables which are scattered over the whole Earth? The celebrated *Linnaeus* reckoned up from seven to eight thousand of them; but he had not travelled. The famous *Sherard*, it is said, was acquainted with sixteen thousand. Another Botanist swells his catalogue up to twenty thousand. Finally, one still more modern, boasts of having himself made a collection of twenty-five thousand; and he estimates the number of those which he has not seen, at four or five times as many. But all these enumerations must be extremely defective, if it is considered, as has been remarked by this last Observer himself, that we know little or nothing of the interior of Africa; of that of the three Arabias, and even of the two Americas; very little of New Guinea, New Holland, and New Zealand, and of the innumerable islands of the South Sea, the greatest part of which are themselves still undiscovered. We know hardly any thing of the Isle of Ceylon, except a little of the coast; and of the great island of Madagascar; of the immense archipelagoes of the Philippines and

Moluccas, and of almost all the Asiatic islands. As to that vast Continent, with the exception of some great roads in the interior, and some part of the coast resorted to by the traffick of Europe, we may affirm that it is wholly unknown to us.

How many immense districts are there in Tartary, in Siberia, and even in many of the kingdoms of Europe, where the foot of Botanist never trod! Some, indeed, have given us a herbal of Malabar, Japan, China, &c. but if we reflect, that, in these countries, their researches never penetrated beyond the sea-coast, and were generally confined to one season of the year, when a part only of the plants, peculiar to each climate, appear; that they have visited only the narrow regions adjoining to our European factories; that they have never dared to plunge into deserts, where they could have found neither subsistence nor guide; nor ventured themselves among the numerous tribes of barbarous Nations, whose language they could not understand; we shall find reason to conclude, that their boasted collections, however valuable, are still extremely defective.

In order to be convinced of this, we have only to compare the time employed by them, in making their collections of plants in foreign countries, with that which it cost *Le Vaillant* to collect those of the vicinity of Paris only. The learned *Tournefort* had already made this a particular study; and, after a master so indefatigable had completed his Work, all the Botanists of the capital, it was thought, might have gone to rest. *Le Vaillant*, his pupil, had the courage to walk over the same ground after him, and discovered such a considerable quantity of distinct species, overlooked by *Tournefort*, that he doubled, at least, the catalogue of our plants. He made it amount to fifteen or sixteen hundred. And even then, he did not include in this enumeration those which differ only in the colour of the flowers, and the spots of the leaves, though Nature frequently employs such signs as these, in the vegetable world, to distinguish the species, and to form their true characters. Hear what *Boerhaave*, his illustrious Editor, says of his laborious researches:

Incubuit quippe huic labori ab anno 1696, usque in Martium 1722; toto quidem tanti decursu temporis in eo occupatus semper, nullum præteriens unquam, cujus plantas haud excuteret

*angulum: vias, agros, valles, montes, hortos, nemora, stagna, paludes, flumina, ripas, fossas, puteos, undequaque lustrans. Contigit ergo, crebro, ut detegeret maximi quæ Tournefortii intetissimos oculos effugerant.** (Preface to the *Botanicon Parisiense*, pages 3 and 4.)

Sebastian le Vaillant, accordingly, employed no less than twenty-six whole years, in his own country, and with the assistance of his pupils, in completing his botanical description of the plants of a few square leagues; whereas the persons who pretend to give us the Botany of many foreign countries, were alone and unassisted, and dispatched the business in a few months. But, though his sagacity and perseverance seem to have left us nothing more to wish for, I have my doubts, whether he has made a complete collection of all the gifts which Flora scatters over our plains; and whether he has seen, if I may use the expression, to the bottom of her basket. Pliny observed plants, in places, not comprehended in *Boerhaave's* enumeration, and which grow on the tiles that cover our houses, on rotten sieves, and on the heads of ancient statues. It is undoubtedly certain, that we are, from time to time, discovering some, at so great distance from Paris, which have no place in the *Botanicon* of *Le Vaillant*.

For my own part, if I might be permitted to hazard a conjecture, respecting the number of the distinct species of plants, spread over the Earth, such is my idea of the immensity of Nature, and of her subdivisions, that I am disposed to believe, there is not a square league of earth, but what presents some one plant peculiar to itself, or, at least, which thrives there better, and appears more beautiful, than in any other part of the world. This makes the number of the primordial species of vegetables amount to several millions, diffused over as many

* He devoted his whole attention to this laborious undertaking, from the year 1696 to March 1722. During a period of such length, he was constantly and unweariedly employed in it, never passing by the smallest corner without examining what plants it contained. With the eye of an Observer, he pried into every place, the roads, fields, vallies, mountains, gardens, forests, pools, morasses, rivers, their banks, ditches, wells: hence he had, frequently, the good fortune, to discover many things which escaped the eager eyes of the great *Tournefort*.

millions of square leagues, of which the surface of our Globe consists. The farther south we advance, the more their variety increases within spaces of the same dimension. The Isle of Otahité in the South Sea was found to have a botany peculiar to itself, and which had nothing in common with that of the places in Africa and America, which are situated in the same latitude ; nay, totally different from that of the adjacent islands. And if we now reflect, that each plant has several different names, in its own country ; that every Nation imposes particular denominations, and that all these names, at least the greater part, are varying every age, what difficulties does not the vocabulary alone oppose to the study of Botany ?

All these preliminary notions, however, would still form only a useless Science, did we even know, in the most complete detail, all the parts of which plants are composed. It is the combination of these parts, the attitude of the plants, their port, their elegance, the harmonies which they form, when grouped, or in contrast with each other, which it would be interesting to determine. I do not know that any thing has been so much as attempted on this subject.

As to their virtues, it may be affirmed, that they are for the most part unknown, or neglected, or abused. Their qualities are often perverted, in making cruel experiments on innocent animals, while they might be usefully employed as miraculous remedies, to counteract the ills of human life. We have preserved, for example, in the Royal Cabinet at Paris, arrows more formidable than those of Hercules, though dipped in the blood of the snake of Lerna. Their points are impregnated with the juice of a plant so venomous, that, though exposed to the air for many years, they can, with the slightest puncture, destroy the most robust of animals, in a few minutes. The blood of the creature, be the wound ever so trifling, instantly congeals. But if the patient, at the same instant, is made to swallow a small quantity of sugar, the circulation is immediately restored. Both the poison and the antidote, have been discovered by the savages who inhabit the banks of the Amazon ; and it is of importance to observe, that they never employ in war, but only in the chase, this murderous method of destroying life.

Wherefore do not we, who pretend to so much humanity and illumination, endeavour to ascertain by experiment, whether this

poison might not be rendered medicinal, in cases of a sudden dissolution of the blood; and sugar, in cases of sudden coagulation? Alas! how is it to be expected that we should apply to the preservation of Mankind, the malignant and destructive qualities of a foreign vegetable, we who are continually abusing, for mutual destruction, the precious gifts which Nature has bestowed, in the view of rendering human life innocent and happy? The elm and the beech, under the shade of which our shepherds and their mates delight to dance, are hewn down into carriages, for mounting the thundering artillery. We intoxicate our soldiers into madness, that they may kill each other, without hatred, with that very juice of the vine which Providence has given to be the means of reconciliation among enemies. The lofty fir-trees, planted by the benignant hand of Nature, amidst the snows of the North, to shelter and warm the inhabitants, converted into masts for the vessels of Europe, to carry the flames of devouring fire against the peaceful inhabitants of the Southern Hemisphere; and the canvas, designed for the humble clothing of the village-maid, becomes a sail for the plundering corsair, to extend his ravages to remotest India. Our crops, and our forests, are wafted over the Ocean, to spread desolation over both the Old and New Worlds.

But let us drop the history of Man, and resume that of Nature. If, from the vegetable, we make a transition to the animal kingdom, a field of incomparably greater extent presents itself. An intelligent Naturalist, at Paris, some years ago announced, that he was in possession of more than thirty thousand distinct species of animals. I know not whether the King's magnificent Cabinet may not contain more; but I know well, that his Herbals contain only eighteen thousand plants, and that about six thousand are in a state of cultivation in the Royal Botanic Garden. This number of animals, however, so superior to that of vegetables, is a mere nothing, in comparison with what exists on the Globe.

When we recollect, that every species of plant is a point of union for different genera of insects, and that there is not, perhaps, a single one, but which has, peculiar to itself, a species of fly, butterfly, gnat, beetle, lady-bird, snail, and the like; that these insects serve for food to other species, and these too exceeding numerous, such as the spider, the dragon-fly, the ant,

the formicaleo; and to the immense families of small birds, of which many classes, such as the wood-pecker, and the swallow, have no other kind of nourishment; that these birds are, in their turn, devoured by birds of prey, such as kites, falcons, buzzards, rooks, crows, hawks, vultures, and others; that the general spoil of these animals, swept off by the rains, into the rivers, and thence to the sea, becomes the aliment of almost innumerable tribes of fishes, to the greatest part of which the Naturalists of Europe have not hitherto given a name; that numberless legions of river and sea-fowls prey upon these fishes: we shall have good ground for believing, that every species of the vegetable kingdom serves as a basis to many species of the animal kingdom, which multiply around it, as the rays of a circle round its centre.*

At the same time, I have not included in this superficial representation, either quadrupeds, with which all the intervals of magnitude are filled, from the mouse, which lives under the grass, up to the camelopard, who can feed on the foliage of trees, at the height of fifteen feet; or the amphibious tribes; or the birds of night; or reptiles; or polypuses, of which we have a knowledge so slender; or sea insects, some families of which, such as the crab-fish, shrimp, and the like, would be alone sufficient to fill the greatest cabinets, were you to introduce but a single individual of every species. I do not include the madreporé, with which the bottom of the sea is paved between the Tropics, and which present so many different species, that I have seen, in the Isle of France, two great halls filled with those which were produced in the immediate vicinity of that Isle, though there was but a single specimen of each sort

* There can be no doubt that the whole number of animals upon this earth, in its waters, and in its atmosphere, is infinitely greater than that of the vegetables. The number of plants, now known, may amount to about thirty-two or thirty-three thousand. It is not probable that this is more than three-fourths of the whole number of those which do actually exist. But the number of animals already known is, at least, fifty thousand; and when it is considered that the discovery of almost every new species of vegetable makes us acquainted with a new species of insect: above all, when we reflect, what numbers of animal existences are daily brought to light through the medium of the microscope, we actually see no limits to our inquiries into the number of animals. With great probability, may we conjecture, that many centuries must pass away, before we shall be able to form any tolerable estimate of the catalogue of the (now) living animals.—B. S. B.

I have made no mention of insects of many kinds, as the louse and the maggot, of which every animal species has its particular varieties, proper to itself, and which triple, at least, the kingdom of creatures existing by respiration. Neither have I taken into the account, that infinite number of living things, visible and invisible, known and unknown, which have no fixed determination, and which Nature has scattered about, through the Air, over the Earth, and along the depths of the Ocean.

What an undertaking, then, would it be, to describe each of these beings, with the sagacity of a *Reaumur*? The life of one man of genius, would be scarcely sufficient to compose the History of a few insects. However curious may be the memoirs transmitted to us, after the most careful research, respecting the manners, and the anatomy, of the animals most familiarly known, in vain do we still flatter ourselves with our having acquired a complete acquaintance. The principal requisite, in my opinion, is yet wanting; I mean, the origin of their friendships and of their feuds. In this consists, if I am not mistaken, the essence of their History, to which must be referred their instincts, their loves, their wars; the attire, the arms, and the very form which Nature gives them. A moral sentiment seems to have determined their physical organization. I know not of any Naturalist who has engaged in a research of this sort.* The Poets have endeavoured to explain these wonderful and innate instincts, by their ingenious fictions. The swallow Progné flies the forest; her sister Philomela delights to sing in solitary places. Progné thus, one day, addresses her:

Le desert est-il fait pour des talens si beaux ?
Venez faire aux cites eclater leurs merveilles ;
Aussi bien, en voyant les bois,

* I flatter myself that *some* of the views of Saint-Pierre will be accomplished, in a work in which I have been long engaged ; “ On the Instincts and Manners of all the known Families of Animals.” Considerable portions of this work, which however it will demand years of additional labour and research to accomplish even to my own satisfaction, have been publicly read, at different times, to my classes in the University of Pennsylvania. A fragment, or sketch, of the larger and more finished work, I hope to be able to print, for the satisfaction of the curious and particularly of my friends, in the course of three or four years. The work will be embellished with a considerable number of plates, engraven after original drawings, by the ablest artists.—B. S. B.

Sans cesse il vous souvient que Térée autrefois,

Parmi des demeures pareilles,

Exerca sa fureur sur vos divins appas.—

Et c'est le souvenir d'une si cruel outrage,

Qui fait, reprit sa sœur, que je ne vous suis pas :

En voyant les hommes, hélas !

Il m'en souvient bien davantage.*

I never hear the enchantingly melancholy song of a nightingale, shrouded in shrubbery, and the lengthened piou-piou, which interrupt, like sighs, the music of that solitary songster, without believing, that Nature had revealed her adventure to the sublime *La Fontaine*, at the time she inspired him to compose these verses. If these fables were not the history of men, they would be, to me at least, a supplement to that of animals. Philosophers of name, unfaithful to the testimony of their reason and conscience, have dared to represent them as mere machines. They ascribe to them blind instincts, which regulate, in a manner perfectly uniform, all their actions, without passion, without will, without choice, and even without any degree of sensibility. I one day expressed my astonishment at this to *J. J. Rousseau*; and said to him, it seemed exceedingly strange, that men of genius should maintain a position so extravagant. He very sagely replied, *The solution is this, When Man begins to reason, he ceases to feel.*

In order to confute the opinions of such Philosophers, I shall have recourse, not to those animals whose sagacity and industry excite our admiration, such as the beaver, the bee, the ant, and such like. I shall produce only one example, taken from the class of those which are most indocile, namely fishes, and shall select it from among a species, governed by an instinct the most impetuous and the most stupid, which is gluttony.

* Thus imitated :

Why waste such sweetness on the desert air ?

Come, charm the city with thy tuneful note ;

Think too, in solitude, that form so fair

Felt violation : flee the horrid thought.

Ah ! sister dear, sad Philomel replies,

'Tis this that makes me shun the haunts of men :

Tereus and Courts the anguish'd heart allies,

And hastes, for shelter, to the woods again.

The shark is a fish so voracious, that he will not only devour his own species, when pressed by hunger, but swallows, without distinction, every thing that drops from a ship into the sea, cordage, cloth, pitch, wood, iron, nay, even knives. Nevertheless, I have been a frequent witness of his abstinence, in two remarkable circumstances; the one is, however urged by famine, he never touches a kind of small fish, speckled with yellow and black, called the pilot-fish, which swims just before his snout, to guide him to his prey, which he cannot see till he is close to it; for Nature, as a counterbalance to the ferocity of this fish, has rendered him almost blind.* The other case is this, when you throw into the sea a dead fowl, the noise brings him to the spot, but on discovering it to be a fowl, he immediately retires, without devouring it; this has furnished sailors with a proverb: *The shark flies from the feather.* It is impossible, in the first case, not to ascribe to him some portion of understanding, which represses his voracity, in favour of his guide; and not to attribute, in the second, his aversion to feathered flesh, to that universal reason, which, destining him to live along the shallows, where cadaverous substances of creatures perishing in the sea, fall and are deposited, inspires him with an aversion for feathered animals, that he may not destroy the sea-fowls, which resort thither in great numbers, employed, like himself, in looking out for a livelihood, and in cleansing the shores from impurities.

Other Philosophers, on the contrary, have ascribed the manners of animals, as those of men, to education; and their natural affections, as well as their animosities, to resemblance or dissimilitude of form. But if friendship is founded in similitude of form, how comes it, that the hen, who walks in security

* The "abstinence" of the shark, in regard to the pilot-fish, is one of the most interesting facts in natural history; and it appears, from late observations, to be a fact fully authenticated. On this subject, the remarks of Mr. Geoffrey, of Paris, seem to be highly worthy of the notice of the curious readers of these *Studies*. A translation of the remarks from the *Bulletin des Sciences*, may be seen in Mr. Hillcock's *Philosophical Magazine*, vol. xiii. p. 354, &c. The pilot-fish is the *gasterosteus dactor* of Linnæus. "It would be, no doubt (says Mr. Geoffrey,) curious to inquire what interest can induce animals so different in their organization, their size, and habits, to form a sort of association. Does the pilot-fish feed on the dung of the shark? as C. Bosc thinks; and has it imposed on itself the painful duties of domesticity to find protection and safety in the neighbourhood of so voracious an animal?"—B. S. B.

at the head of her brood, among the horses and oxen of a farm-yard, though part of her family is sometimes accidentally crushed by the feet of those animals, collects her young, with anxious inquietude, at the sight of the hawk, a feathered animal like herself, who appears in the air but as a black point, and whom, perhaps, she hardly, if ever, saw before? Why does the dog in the yard fall a barking, in the night time, at the smell only of the fox, an animal which has a strong resemblance to himself? If habits of long standing could influence animals, as they do men, how has it been possible to render the ostrich of the desert familiar to such a degree, that he has been made to carry children on his plumeless crupper; whereas no skill has, hitherto, been able to tame the swallow, a bird which has, from time immemorial, built her nest in our houses?

Where can we find, among the Historians of Nature, a *Tacitus*, who shall unveil to us these mysteries of the Cabinet of Heaven, without an explanation of which, it is impossible to write the History of a single animal on the Earth? We find no one species deviating, like the human, from the laws imposed on it by Nature. Bees, universally, live in republics, as they did in the time of *Esop*. The common fly has always been a vagabond, one of a herd without any police or restraint. How comes it that, among these, no *Lycurgus* has ever yet arisen, to reduce them into order, for the general good; and to prescribe to them, as Philosophers tell us the first Legislators among men did, laws dictated by their weakness, and by the necessity of uniting in society?

On the other hand, Whence is it, as *Machiaval* affirms of Nations possessing too much happiness, that among the canine species, exulting in the superiority of their strength, no *Catiline* arises, to impel his associates to take advantage of the security of their masters, and to destroy them at once; no *Spartacus* to rouse them to liberty by his howling, that they might live as sovereigns of the forest, they to whom Nature has given arms, courage, and skill to subdue, in whole armies, animals the most formidable? When so many trivial laws of Nature are, under our very eyes, unknown, or misunderstood, how dare we presume to assign those which regulate the course of the stars, and which embrace the immensity of the Universe?

To the difficulties opposed to us by Nature, let us add those which we ourselves throw in the way. First, methods and systems of all sorts prepare, in every man, his manner of viewing objects. I do not speak of Metaphysicians, who explain all by means of abstract ideas; nor of Algebraists, with their formulas; nor of Geometricians, with their compasses; nor of Chymists with their salts; nor of the revolutions which their opinions, though intolerant in the extreme, undergo in every age. Let us confine ourselves to notions the most universally admitted, and supported by the highest authority.

To begin with Geographers. They represent the Earth as divided into four principal parts, whereas, in reality, there are only two. Instead of the rivers which water it, the rocks which form its barriers, the chains of mountains which divide it into climates, and other natural subdivisions, they exhibit it speckled all over with party-coloured lines, which divide and subdivide it into empires, dioceses, principalities, electorates, bailiwicks, salt-magazine districts. They have disfigured the originals, or substituted names without a meaning, in place of those which the native inhabitants of every country had given them, and which so well expressed their nature. They call, for example, a city, near to that of Mexico, where the Spaniards shed such oceans of human blood, the *City of Angels*, but to which the Mexicans gave the name of *Cuet-lax-cupan*, that is, *the snake in the water*, because that of two fountains, which issue from thence, one is poisonous; they call the *Mississippi*, that great river of North America, which the natives denominate *Mechassipi*, *the father of waters*; the *Cordeliers*, those high mountains bordering on the South Sea, which are always covered with snow, and which are called by the Peruvians in the royal language of the Incas, *Ritisuyu*, *snow-ridge*; and so of an infinite number of other proper names. They have stripped the works of Nature of their distinctive characters, and Nations of their monuments.

On reading these ancient names, with their explanations, in *Garcillaso de la Vega*, in *Thomas Gage*, and the earliest navigators, you have impressed on the mind, by means of a few simple words, the landscape of every country, and something

of it's Natural History : * without taking into the account, the respect attached to their antiquity, for this renders the places which they describe still more venerable. Those only of the Chinese, who traffic with the Europeans, know that their country is called China. The name given it by the inhabitants is *Chium-hoa*, the *Middle Kingdom*. They change the name of it, when the families of their sovereigns become extinct. A new dynasty gives it a new name ; thus the law has determined, to instruct Kings, that the destiny of their people was attached to them, as that of their own family. Europeans have destroyed all these correspondencies. They shall for ever bear the punishment of this injustice, as well as that of so many other of their violations ; for, obstinately persevering to give what names they please to the countries which they seize, or in which they settle, it comes to pass that, when you see the same countries on maps, or in Dutch, English, Portuguese, Spanish,

* This remark is in an eminent degree applicable to the names of the rivers, mountains, vallies, &c., of North-America. Thus, as indeed our author has remarked, we have *Mississippi*, which signifies, the great river ; *Monongahela*, or, “ the river whose banks are falling in” ; *Jenisseia*, “ the river of beautiful vallies” ; *Roanoke*, “ the river abounding in money-shells,” or wampum ; and many others of the like kind. Never do these names mislead us. They actually impress upon our minds, by means of a few simple words, the landscape of the country, and very frequently something of its natural history. You must not expect to find the banks of the Monongahela (at Pittsburgh, at least,) permanent, or unwaisting : and you may be assured, by its name, that the Jenisseia glides through a country of fine rich interval grounds. Our Indians have given to one of their rivers, the name of the “ river of the great horn.” In the bed of this river at the distance in all probability of some centuries, from the period at which the name was bestowed upon it, we have discovered an enormous *defense*, or tooth, of a species of elephant, which the Indians, for want of more precise information, took to be the horn of an animal.—How much is it to be regretted, that we have taken so little pains to obtain the aboriginal names of our rivers, &c., together with the exact import of those names ! Every day, with the increase of population, and the improvements or alterations of the country, the subject becomes more and more interesting. Where is the cultivated American who does not now feel anxious to know the ancient names of the Hudson and the Delaware ? Let it not be said, these names were imposed by savages. The first inhabitants of all countries were savages. *Italia*, *Italy*, rendered sacred by the talents of its ancient historians, and orators, and poets ;—I say nothing of its reputed liberty ;—*Italia* : What is the import of this name ? According to Aulus Gellius, “ the country of oxen.”—B. S. B.

or French books of travels, you are utterly incapable of distinguishing any thing. Their very longitude is changed, for every nation makes it's own capital the first meridian.

Botanists mislead us still more. I have spoken of the perpetual variations of their dictionaries ; but their method is no less faulty. They have devised, in order to distinguish plants, characters the most complicated, which frequently deceive them, though derived from all the parts of the vegetable kingdom, while they have never been able to express, by a single descriptive term, their combinations, from which the unlearned can distinguish them at first sight. They must have magnifying glasses and scales, in order to class the trees of a forest. It is not sufficient to see them standing and covered with leaves, the Botanist must examine the flower, and frequently the fruit too. The clown knows them all perfectly, in the boughs which compose his faggot.

In order to give me an idea of the varieties of germination, I am shewn, in bottles, a long series of naked grains of all forms ; but it is the capsule which preserves them, the downy tuft which re-sows them, the elastic branch which darts them to a distance, that it imports me to examine. To shew me the character of a flower, it is presented to me dry, discoloured, and spread out on the leaf of a herbary. Is it in such a state that I can distinguish a lilly ? Is it not rather on the brink of a rivulet, raising it's stately stem over the verdant declivity, and reflecting in the limpid stream, it's beautiful calix* whiter

* According to Botanists, the lily has no *calix*, but only a *corolla*, consisting of many petals. They call the flower a corolla, and the case which contains the flowers a calix. This is, evidently, an abuse of terms. *Calix*, in Greek, and in Latin, means a cup ; and *corolla*, a little crown. Now, an infinite number of flowers, as the cruciform, the papilionaceous, those with long throats, and a multitude of others, are not formed like a coronet, nor their cases like cups. I dare venture to affirm, that if Botanists had given the simple name of case, or wrapper, to the parts of the plant which inclose and protect the flower before it blows, they would have been on the road to more than one curious discovery. This impropriety of elementary terms in the Sciences, is the first twist given to human reason ; it is thereby put, from the very first setting out, entirely aside from the path of Nature.—See Vol. II. Study XI.

Our author is not here as correct as in many other parts of his work. It is not the unanimous opinion of the botanists. that the lily has no

than ivory, that I discern, and admire, the king of the vallies ? Is not it's incomparable whiteness rendered still more dazzling, when spotted, as with drops of coral, by the little, scarlet, hemispherical lady-bird, garnished with black specks, which constantly resorts to it as an asylum ? Who can discover the queen of flowers in a dried rose ? In order to it's being an object, at once, of love and of philosophy, it must be viewed when, issuing from the cleft of a humid rock, it shines on it's native verdure, when the zephyr balances it, on a stem armed with thorns ; when Aurora has bedewed it with her tears ; when, by it's lustre and it's fragrance, it invites the hands of lovers. A cantharide, sometimes, lurking in it's corolla, heightens the glowing carmine, by presenting the contrast of his emerald coloured robe ; it is then this flower seems to say, that, symbol of pleasure, from her charms, and the rapidity of her decay, like pleasure too, she carries danger around her, and repentance in her bosom.

Naturalists betray us into still wider deviations from Nature, in attempting to explain, by uniform laws, and by the mere action of air, water, and heat, the expansion of so many plants, growing on the same dunghill, of colours, forms, savours, and perfumes so different. Do they try to decompound the principles of them ? Poison and food present, in their stoves, the same results. Thus Nature sports herself with their art, as with their theory. The corn plant alone, gathered in handfuls only by the vulgar, answers a thousand valuable purposes, while a multitude of vegetables have remained entirely useless in the laboratories of the learned.

I remember my having read, many years ago, several grave dissertations on the manner of employing the horse-chesnut as food for cattle. Every Academy in Europe has, at least, proposed it's own ; and the result of all their learned disquisitions was, that the horse-chesnut was useless, unless prepared by a very expensive process, and that, even then, it was good only

calix. On the contrary, Jussieu, and many others botanists, both in France and in other countries, agree in calling the only cover, or wrapper, with which the lily, the tulip, &c., are supplied, the calix : *calix campanulatus* of Jussieu. But this is not all : the term calix is from the Greek *καλυξ*, and originally from *καλυπτω*, to cover, and not from *καλιξ*, a cup.—B. S. B.

in the manufacture of tapers and hair-powder. I was astonished at this: not that Naturalists should be ignorant of it's use, and that they had studied it merely as an article of luxury, but that Nature should have produced a fruit of no use even to the brute creation. But I was at last cured of my ignorance, by the brutes themselves. I happened to take my walk, one day, to the *Bois de Boulogne*,* with a branch of the horse-chesnut in my hand, when I perceived a goat feeding. I went up and amused myself with stroking her. As soon as she perceived the horse-chesnut bough, instantly she seized, and snapped it up. The lad who tended her told me, that the goats were all very fond of this plant, and that it contributed greatly to the increase of their milk. I perceived, at some distance, in the chesnut alley, which leads to the *Chateau de Madrid*, a herd of cows eagerly looking for horse-chesnuds, which they greedily devoured without sauce or pickle. Thus, our learned and ingenious systems conceal from us natural truths, with which every peasant is acquainted.

What a spectacle do our cabinets of preserved animals present? To no purpose has the art of a *Daubenton* endeavoured to keep up the appearance of life. Let industry do it's utmost to preserve the form, their stiff and motionless attitude, their fixed and staring eyes, their bristly hair, all declare that they have been smitten with the stroke of death. In such a state, even beauty itself inspires horror; whereas objects the most homely are agreeable, when placed in the situation which Nature has assigned them. I have been often highly diverted, in the West-Indies, at the sight of a crab on the sand, straining, with his claws, to break into a huge cocoa-nut; or a shaggy ape balancing himself on the summit of a tree, at the extremity of a *lianne*, loaded with pods and brilliant flowers.

Our books of Natural History, are merely the romance of Nature, and our cabinets her tomb. To what a degree have our speculations and our prejudices degraded her? Our treatises on Agriculture shew us, on the plains of Ceres, nothing but bags of grain; in the meadows, the beloved haunt of the

* The *Bois de Boulogne*, and *Chateau de Madrid*, are a wood, and castle, not many miles from Paris.

nymphs, only bundles of hay ; and in the majestic forest, only cords of wood and faggots.

What shall we say of the violence done to her by Pride and Avarice ? How many charming hills have been reduced to a state of villanage, by our laws ! What majestic rivers degraded into servitude by imposts !

The History of Man has been disfigured in a very different manner. If we except the interest which religion, or humanity, has prompted some good men to take, in favour of their fellow-creatures, the rest of Historians have written under the impulse of a thousand different passions. The Politician represents Man, as divided into nobility and commonalty, into papists and huguenots, into soldiers and slaves ; the Moralist, into the avaricious, the hypocritical, the debauched, the proud ; the Tragic Poet, into tyrants and their victims ; the Comic, into drolls and buffoons ; the Physician, into the pituitous, the bilious, the plegmatic. They are universally exhibited as subjects of aversion, of hatred, or of contempt : Man has been universally dissected, and now nothing is shewn of him but the carcase. Thus the master-piece of creation, like every thing else in Nature, has been degraded by our learning.

I do not mean to affirm, however, that from such partial means, no useful discovery has proceeded : but all these circles, within which we circumscribe the Supreme Power, far from determining it's bounds, only mark the limit of human genius. We accustom ourselves to crowd all our own ideas into that narrow space, and dishonestly to reject all that does not accord with them. We act the part of the tyrant of Sicily, who fitted the unhappy traveller to his bed of iron : he violently stretched, to the length of the bed, the limbs of those who were shorter, and cut short the limbs of those who were longer. It is thus we apply all the operations of Nature to our pitiful methods, in order to reduce the whole to one common standard.

Hurried away myself, by the spirit of the age in which I live, I gave, at the end of the journal of my voyage to the Isle of France, a system of botany, in which I pretended to explain the expansion of plants, as our Naturalists explain that of Madrépores, from the mechanism of the small ani-

imals which constitute them. I quote this work, though I composed it merely as an amusement, to prove how easy it is to support a false principle by true observations; for, having communicated it to *J. J. Rousseau*, who was, it is well known, a great proficient in Botany, he said to me; *I do not adopt your system; but it would cost me, at least, six months to refute it; and even then, I could not flatter myself with the certainty of having succeeded.* Had the decision of this candid gentleman been wholly unreserved, it could not have justified my libertinism.

Fiction embellishes the History of Man only, it degrades that of Nature. Nature is herself the source of all that is ingenious, amiable, and beautiful. By applying to her the violence of our imaginary laws, or by extending to all her operations, those with which we are acquainted, we conceal others, worthy of the highest admiration, with which we are totally unacquainted. We add, to the cloud with which she veils her divinity, that of our own errors. They get into credit by time, by professorships, by books, by protectors, by associations, and especially by pensions; whereas no one is paid for searching after truths, which have the improvement of mankind for their only object. We carry with us, into researches so independent and so sublime, the passions of the college and of the world, intolerance and envy.

Those who enter first on the career, oblige those who come after them to walk in their footsteps, or to give it up; as if Nature were their patrimony, or as if the study of Nature were an exclusive trade, that did not admit of every one's participation. What trouble did it cost to eradicate, in France, the metaphysics of *Aristotle*, which had become a species of religion? The philosophy of *Descartes*, which supplanted it, might have subsisted to this day, had it's revenues been as ample. That of *Newton*, with it's attractions, is not more solidly established. I have an unbounded respect for the memory of those great men, whose very deviations have assisted us, in opening great highways through the vast empire of Nature; but, on more occasions than one, I shall combat their principles, and especially, the general applications which have been made of them, in the full persuasion, that if I renounce

their systems, I promote their intentions. It was the study of their whole life to raise men toward the DEITY, by their sublime discoveries, without suspecting that the laws which they were establishing in Physics, might, one day, serve to subvert those of morality.

In order to form a right judgment of the magnificent spectacle of Nature, we must suffer every object to remain in its place, and remain ourselves in that which he has assigned to us. It is from a regard to our happiness that she has concealed from us the laws of her Omnipotence. How is it possible for a being so feeble as Man to embrace infinite space? But she has brought within our grasp what it is at once useful and delightful to know: namely, the emanations from her beneficence. In the view of uniting Mankind, by a reciprocal communication of knowledge, she has given to each of us in particular, ignorance, treasuring up Science in a common stock, in order to render us necessary and interesting to each other.

The Earth is covered over with vegetables and animals, the simple vocabulary of which no Scholar, no Academy, no one Nation, will ever be able perfectly to acquire; but it is to be presumed, that the human race is acquainted with all their properties. In vain do enlightened Nations boast, that they are the great repositories of all the Arts and Sciences. It is to Savages, to men utterly unknown, that we are indebted for the first observations, which are the source of all Science. It is neither to the polished Greeks nor Romans, but to Nations which we denominate barbarous, that we owe the use of simples, of bread, of wine, of domestic animals, of cloths, of dye-stuffs, of metals, and of every thing most useful, and most agreeable, for human life.

Modern Europe glories in her discoveries; but the invention of the art of Printing, one of the fairest titles to immortality, is to be ascribed to a person so obscure, that several cities in Holland, of Germany, nay, of China, have claimed the discovery as their own. *Galileo* would never have calculated the gravity of air, but for the observation of a fountain-player, who remarked that water could rise only up to thirty-two feet in the tubes of a forcing engine. *Newton* had never read the starry heavens, unless a spectacle-maker's children in Zealand had, at

play with the lenses in their father's shop, suggested the first idea of the telescopic cylinder. Our artillery would never have subjugated the New World, but for the accidental discovery of gun-powder by a lazy monk; and whatever glory Spain may pretend to derive from the discovery of that vast Continent, the Savages of Asia had planted Empires there, long before the arrival of *Christopher Columbus*. What must have become of that great man himself, if the good and simple inhabitants whom he found in the country, had not supplied him with provisions? Let academies, then accumulate machines, systems, books, eulogiums: the chief praise of all is due to the ignorant, who furnished the first materials.

Advancing no higher claim, I presume to contribute my humble offering. It is the fruit of many years of application, which, amidst storms long and severe, stole away in these calm researches, like a single day of serenity. I earnestly wished, if it should not be permitted me to reach a boundary at which to stop, to communicate to others, at least the pleasure which I had enjoyed on my way.

I have conveyed my observations in the best style of which I am capable; frequently stepping aside to the right hand and to the left, as the subject carried me; sometimes abandoning myself to a multitude of projects, which the infinite intelligence of nature inspires; sometimes dwelling with complacency on happier seasons and situations, which are never more to return; sometimes plunging into futurity, panting after a more fortunate state of being, of which the goodness of Heaven affords us now and then a glimpse, through the dark clouds of this wretched life. Descriptions, conjectures, perceptions, views, objections, doubts, nay, my very ignorances, I have heaped all on one pile; and I have given to these ruins the name of *Studies* as the Painter does to the studies of a great original, to which he was unable to give a finishing.

Amidst this disorder it was necessary, however, to adopt something like method, without which, the confusion of the matter must have still more increased the insufficiency of the Author. I have followed the most simple. First, I endeavour to refute the objections raised against a Providence; I then proceed to examine into the existence of certain sentiments, which are common to all men, and which constrain us to acknowledge,

in all the works of Nature, the laws of her wisdom and goodness; and, finally, I make application of these laws to the Globe, to Plants, to Animals, and to MAN.

Such, from the outset, is the manner in which I propose to direct my course. If, in the rapid sketch which I am going to represent of it, the reader should be disgusted with its dryness, I must intreat him to reflect, that the same complaint must lie against all abridgments; that, in return, I spare him the fatigue of a preface; and that *Pliny*, who had a much better head than mine, has not hesitated to make up the first book of his *Natural History*, of the bare titles of the Chapters which compose it.

I said then to myself: In the FIRST PART of my Work, I will display the blessings bestowed by Nature on the age in which we live; and the objections which have been started in it, against the providence of its AUTHOR. I will conceal no one of these that I know of; and in order to give them greater force, I will exhibit them in their combination. I will employ, in refuting them, not metaphysical reasonings, like those of which the objections consist, and which never brought any dispute to a termination, but the facts themselves of Nature, which admit of no reply. With these same facts, I will raise, in my turn, difficulties which militate against the principles of human Science, and which have been deemed infallible. I will from thence proceed to infer the feebleness of our reason; I will enquire whether there be universal truths, and what we are to understand by order, beauty, correspondency, harmony, pleasure, happiness, and their contraries; and, finally, what an organized body is.

From this examination of our faculties, and of the effects of Nature, will result the evidence of many physical laws, constantly directed to one single end, and that of a moral law, which affects Man alone, and the sentiment of which has been universal, in all ages, and among all nations. These are necessary preliminaries. Before we attempt to rear the fabric, the ground must be cleared, and the foundation laid.

In the SECOND PART, I shall make application of these laws to the Globe; I shall examine its form, its extent, the division of its Hemispheres; and as it is composed, like every other organized work of Nature, of parts similar and of parts contrary, I shall consider, successively, its different elements, and the manner of their adaptation to each other, the fire to air, the

air to water, the water to the earth. This order establishes among them a real subordination of which the Sun is the principal agent. But he is not the only mover in Nature, and still less the Sovereign Disposer. His uniform action on the elements would, at last, separate or confound them. Other laws counterbalance his, and maintain the general harmony.

I shall point out the admirable variety of his course, the effects of his heat and light, and the wonderful manner in which they are weakened or multiplied in the Heavens, in the inverse ratio of latitudes and seasons. I shall speak of the great reverberations of Heaven, of the Moon, of the *Aurora Borealis*, of the Stars, and of the mysteries of Night, only so far as the human eye is permitted to perceive them, and the heart to feel their impression.

I shall speak, likewise, of the nature of *Fire*, not to explain it, but to evince our profound ignorance of the subject. This element, which renders all things else perceptible, itself eludes our most eager researches. We shall demonstrate, that there is neither animal, nor plant, nor even fossil, capable of subsisting any length of time in it. It is the only being which increases its bulk by communicating itself. It penetrates all bodies, without being penetrated by them. It is divisible only in one dimension. It has no gravity. Though nothing attracts it to the centre of the Earth, it is diffused through all the parts of the Globe. Its nature differs from that of all other bodies. Its destructive and indefinable character seems to favour the opinion of *Newton*, who considered it only as a motion communicated to matter, and who thereby reduced the number of Elements to three. However, as it is one of the four general principles of life in every living creature; as we often discover it, in others, in a dormant state, and as there is no one, as we shall see, but what has organs, or parts, disposed to weaken, or to multiply these effects, we must acknowledge it not only to be an Element, but Nature's primary agent.

From the *Fire* I shall pass to the *Air*. I shall examine the quality which it has of expanding and contracting, of heating and cooling; and the effects of that vast stratum of frozen air which surrounds our Globe, about a league above the surface, and of which hardly any one of the phenomena has hitherto been explained.

I shall next consider the effects of *Water*: in what manner heat evaporates, and cold fixes it; its different existences; of its volatility in the air, in clouds, in dew, and in rain; of its fluidity on the earth, in rivers, and in Seas; of its solidity at the Poles, and on lofty mountains, in snow and ice. I shall enquire how the Seas, which are the great reservoirs of this element, are distributed, with relation to the Sun; how they receive from him, through the mediation of the air, a part of their movements; in what manner they continually renew their waters, by means of the ice accumulated at the Poles; the annual or periodical fusion of which maintains their flux and reflux as constantly as the fusion of the ices on the summit of high mountains renews and supplies the waters of great rivers. I shall hence deduce the phenomena of the Tides, of the Monsoons in the Indian Ocean, and of the principal Currents of the vast watery Element.

I shall afterwards hazard my conjectures respecting the quantity of water which surrounds the Earth, in the three states of volatility, fluidity, and solidity; and shall examine whether it is possible that, on being all reduced to a state of fluidity, they should entirely cover the Globe.

I shall consider in what manner all parts of the *Earth*, that is, the dry land, are distributed with relation to the Sun; so that there should be no cavity of valley, nor elevation of rocky mountain, but what must be, at some season of the year, exposed to his rays, and disposed, at the same time, in the most perfectly adapted order, to multiply, or to mitigate his heat, by its form, or even by its colour. I will demonstrate that, notwithstanding the apparent irregularity of the different parts of the Globe, they are opposed, with so much harmony, to the different currents of air, that there is no one but what is, by turns, ventilated by winds, hot, cold, dry, and humid; that the cold winds blow most constantly into warm countries, and warm winds into cold countries; that these countries, in their turn, re-act on the air; so that the cause of the winds is not to be sought, according to the received opinion, in the places whence they proceed, but in those which they visit.

I shall after that speak of the direction of mountains, of their declivities, and of their aspects, with relation to the lakes and Seas, whose emanations their different ridges are all adapted to

receive ; of the matter which attracts them, and fixes round their peaks, rising like so many electric needles.

Finally, I shall examine for what reason Nature has divided the Globe into two Hemispheres ; what means she employs to accelerate or retard the course of rivers, and to protect their mouths against the movements and currents of the Ocean. I shall treat of banks, of shallows, of rocks, of isles, whether in seas or rivers ; and I shall prove, I am confident to say, to a demonstration, that these parcels detached from the Continent, are no more ruinous fragments, violently separated from them, than bays, gulfs, and inland seas, are violent irruptions of the Ocean.

I shall terminate this part, by indicating the principal agents employed by Nature, in repairing her works : how she makes use of fire in the form of thunder to purify the air, so frequently loaded with mephitic vapours during the violent heats of Summer ; and the waters of great lakes and seas, by the volcanos which she has placed in their neighbourhood, at the extremity of their currents, and which she has multiplied in warm countries ; how she cleanses the basons of these very waters, which, in the course of a few ages, would be choaked up by the accumulated spoils of the Earth, by means of tempests and hurricanes, which agitate them to the very foundation, and cover their banks with the wreck ; and how, after having restored these wrecks to their first elements, by fires in the air, by volcanos, and the perpetual motion of the waves, which reduces them to sand, and to an impalpable powder on the shore of the Sea, she repairs, by means of winds and attractions, the incessant diminution of the mountains, occasioned by the rains and torrents.

I shall demonstrate, in a word, that, notwithstanding the enormous masses of the mountains, the profundity of the valleys, the tempestuous oceans, and temperatures the most opposite, which enter into the composition of this Globe, the communication of all it's parts has been rendered easy to a being so small and so feeble as Man, and is possible only to him. This last view will furnish me with some curious conjectures respecting the earliest voyages undertaken by Mankind.

I flatter myself that I have said enough to shew, in this simple prospectus, that the same Intelligence, whose productions

we so justly admire in plants and animals, presides equally in the edifice which we inhabit. The earth has hitherto been considered as only in a state of ruin ; and it is this prejudice which renders the study of Geography so insipid ; but I venture to affirm that, after perusing my trifling observations, the course of a rivulet, on a map, will appear more agreeable than the port of a plant in a Botanist's herbal, and the topography of a place, as interesting as it's landscape.

In the THIRD PART of this Work, I will shew how the different parts of plants are disposed in correspondence with the Elements, in such a manner that, far from being a necessary production of theirs, as some Philosophers pretend, they are, on the contrary, almost always in opposition to their action. I shall refer, therefore, their flowers to the Sun ; the thickness of their barks, the scurf which covers their buds, the hair, the down, the resinous substances with which they are clothed, to the absence of solar heat ; the pliancy or stiffness of their stems, to the different impulses of the air ; their leaves, to the waters of Heaven ; finally, their roots, to sands, to mires, to rocks, by their fibres, their pivots, and their long cordage. This last relation of plants to the Earth is, if I may judge, the most important of all though the least observed, for there is not a single one but what is attached to it, whether it floats in water or balances itself in the air ; no one but derives part, at least, of it's nutriment from thence, and in it's turn re-acts on the Earth, by the shade which contributes to it's freshness, by the offal which fertilizes it, and by the roots which binds it's different *strata*.

I shall adhere, however, to the exterior characters by which Nature seems to divide them into different *genera*. Their principal character it is very difficult to determine, not only because the simplest plant unites a very great variety of relations to all the Elements, but because Nature does not place the character of her works, in any one of the parts, but in their combination. We shall seek that of each plant, therefore, in it's grain, which, as being the principle, must unite every thing proper for it's expansion, and determine at least the Element in which it must grow. Those accordingly which have grains extremely volatile, or furnished with tufts of down, pinions, sails, and the like, shall be referred to the Air. They

grow, in fact, in places exposed to the wind, as most part of the gramineous, of the thistle tribe, &c. Those which have fins, floaters, and other instruments of swimming, shall be assigned to the Water; not only such as the fucus, the alga, and other sea-plants, but the cocoa tree, the walnut, the almond, and other vegetables which affect the water's edge. Those, finally, which, by their roundness, and other varieties of form, are adapted for rolling, springing, catching, and so on, and are susceptible of various other movements, shall be allotted to the Earth, properly so called.

This reference of plants to Geography, presents to us at once a great general order of easy comprehension, and a multitude of subdivisions, which we may run over, very agreeably, in detail. First, their *genera* divide themselves, like those of animals, into aerial, aquatic, and terrestrial. Then, their classes are subdivided relatively to the Zones, and to the degrees of latitude of each Zone; such are, to the South, the class of palms, and to the North, that of firs; and their species to the territory of that Zone, according as it is champaign, mountainous, rocky, marshy, and so of the rest. Accordingly, in the class of palms, the cocoa-tree of the sea-shore, the lattanier on the strand, the date of the rocks, the palmist of the mountains, and the other species, crown the various sites of the torrid Zone; whereas in that of firs, the pine, the spruce, the larch, the cedar, and the others, divide among themselves the empire of the North. This order, by putting every vegetable in its natural place, furnishes us, besides, with the means of tracing the use of all its parts; and, I am bold enough to affirm, of tracing the reasons which have determined Nature to vary their form, and to create so many species of the same genus, and so many varieties of the same species, by discovering to us the admirable correspondence which they have, in every latitude, with the Sun, the Winds, the Water, and the Earth.

On this plan, we have a glimpse of the light which Geography may diffuse over the study of Botany; and of the light with which Botany, in its turn, may illuminate Geography; for, supposing we were enabled to form botanical charts, in which, by colours and signs, should be represented in each particular country, the reign of each vegetable there produced, by determining its centre and limits, we might perceive at once

the fecundity proper to each district. This knowledge would supply very ample means of rural economy, as we might substitute to the indigenous plants which were there in greatest abundance, and most vigorous, such of our domestic plants as are of the same species, and which would there infallibly succeed. Besides, these different classes of vegetables would, in their various natural arrangements, indicate the degrees of the humidity, of the dryness, of the cold, of the heat, and of the elevation of each district, with a precision which our barometers, thermometers, and other physical apparatus, can never attain. I omit a multitude of other relations, productive of pleasure and of utility, which would result from such classification, but which I shall endeavour to unfold in their proper place.

In the FOURTH PART, which treats of Animals, I shall pursue the same track. I shall present, first, their relations to the Elements. Beginning with that of Fire, I shall consider the relation which they have to the Luminary which is the source of it, from their eyes furnished with lids and lashes, to moderate the lustre of his light; from that state of torpitude, called sleep, into which most of them fall, when he is no longer above the Horizon; and by the colour of their skin, and the thickness of their furs, corresponding to their distance from him.

We shall then trace the relations in which they stand to the Air, by their attitude, their weight, their lightness, and the organs of respiration; to the Water, by the various curves of their bodies, the unctuousity of their hair and plumage, their scales and fins; and, finally, to the Earth, by the form of their feet, sometimes forked, or armed with prongs and claws, adapted to a hard soil, sometimes broad, or furnished with a hide, suited to a yielding soil, and by other means of progression, which Nature has varied in proportion to the obstacles which are to be surmounted.

On the whole of this we shall observe, as in the case of Plants, that so many configurations, so different, far from being, in animals, mechanical effects of the action of the Elements in which they live, are, on the contrary, almost always in the inverse ratio of these very causes. Thus, for example, a great many fishes are cased in rough and hard shells, in the bosom of the waters; and many animals, the inhabitants of the rocks,

are clothed with soft furs. We shall divide animals, therefore, as we did vegetables, by referring their genus to the Elements, their classes to the Zones, and their species, to the different districts of each Zone. This arrangement at once puts every animal in it's natural place; but we shall reduce it to a fixedness of determination, still more precise, and more interesting, by referring the species of animal to that of the plant which a particular district produces in greatest abundance.

Nature herself indicates this order. She has adapted to plants, the smelling, the mouths, the lips, the tongues, the jaws, the teeth, the beaks, the stomach, the chylication, the secretions which ensue, in a word, the appetite and instinct of animals. It cannot indeed be affirmed with truth, that every species of animal lives on one single species of plant; but any person may convince himself, by experiment, that each of them prefers some one to every other, when permitted to choose. This preference is particularly remarkable at the season when the production of their young engages attention. Then they are determined in favour of that which provides them at once with nutriment, litter, and shelter, in the most perfect suitability to their situation. Thus the goldfinch affects the thistle, and hence, in the French language, derives his name from that of the plant,* because he finds a rampart in it's prickly leaves, food in it's seeds, and materials for his nest in it's down. The bird-fly of Florida, for similar reasons, prefers the bignonia: this is a creeping plant, which finds it's way to the tops of the highest trees and frequently covers the whole trunk. He builds his nest in one of it's leaves, which he rolls into the form of a cornet; he finds his food in it's red flowers, resembling those of the foxglove, the nectareous glands of which he licks; he plunges his little body into them, which appears in the heart of the flower, like an emerald set in coral; and he gets in sometimes so far, that he suffers himself to be surprised there and caught.†

* In French, goldfinch is *chardonneret*, and thistle *chardon*.

† The bird-fly here spoken of is the common humming-bird of the Americans, (the *trochilus colubris* of Linnæus.) I do not think there is any foundation for the assertion, that it prefers the flowers of the bignonia radicans (trumpet-flower) to those of many other vegetables. It seems equally fond

In the nests of animals then we shall look for their character, as we sought that of plants in their grains. It is from these we shall be enabled to determine the Element in which they must live, the proper site of their habitation, the aliment best adapted to their constitution, and the first lessons of industry, of love, or of ferocity, which they receive from their parents. The plan of their life is contained in their cradles. However strange these indications may appear, they are those of Nature, who seems to tell us, that we may distinguish the characters of her children, like her own, in the fruits of love, and the care which they take of their posterity.

She frequently lodges under the same roof the vegetable and animal life, and unites the destiny of the one to that of the other. We see them bursting together from the same shell, blowing, expanding, propagating, dying, in a similar progression. At the same instant of time they present, if I may be allowed the expression, the same metamorphoses. While the plant is unfolding in succession it's germs, it's buds, it's flowers, it's fruits, the insect is displaying successively, on one of it's leaves, the egg, the worm, the nymph, the butterfly, which contains, like it's parents, the seeds of its posterity, with those of the plant which nourished it. It is thus that Fable, far less marvellous than Nature, inclosed the life of the Dryad within the bark of the oak.

These relations are so striking in insects, that Naturalists themselves, notwithstanding their prodigious number of isolated and indeterminable classes, have characterized some of them by the name of the plant on which they live ; such are the ca-

of the flowers of different species of horse-chesnut, those of the coral honeysuckle, the burgamot-flower, &c. I must not omit to mention a fact in regard to this bird, which Saint-Pierre, had he known of it, would have adduced as an instance of his system of harmonies between the animal and vegetable world. The fact is this ; in the vicinity of Philadelphia, we may always confidently expect to see the fly-bird, as soon as the yellow horse-chesnut (which we call buck-eye) expands its blossom : this is generally, about the end of April, or the beginning of May. The food of the fly-bird is not entirely the nectareous juice of flowers. I have elsewhere shown, that it lives, in part, upon minute insects. Saint-Pierre's account of the nest of the bird is altogether erroneous. It does not form its nest in the leaf of the bignonia, or of any other vegetable, but more commonly in the fork of some tree, well protected, however, by a shade of leaves.—B. S. B.

terpillar of the tithymal, and the silk-worm of the mulberry. But I do not believe there is a single animal which deviates from this plan, not even excepting the carnivorous. Though the life of these last appears to be, in some measure, ingrafted on that of the living species, there is not one among them, but what makes use of some species of vegetable. This is observable not only in dogs, which feed on the grass that bears their name, and in wolves, foxes, birds of prey, which eat the plants denominated from the names of the respective animals, but even in the fishes of the sea, which are entire strangers to our Element. They are attracted at first to the banks, by insects whose spoils they collect, which establishes between them and vegetables intermediate relations; afterwards by the plants themselves, for most of them come to spawn on our coasts, only when certain plants are in flower, or in fruit. If these happen to be destroyed, the fishes visit us no longer.

Devis, Governor of Canada, relates in his Natural History of North America,* that the cod which in shoals used to frequent the coasts of the Island of Muscou, disappeared in 1669, because in the year preceding the forests had been devoured by a conflagration. He remarks, that the same cause had produced the same effect in different places. Though he ascribes the disappearance of these fishes to the particular effects of fire, and is in other respects a very intelligent writer, we shall demonstrate, by other curious observations, that it must have been occasioned by the destruction of the vegetables which used to attract them to the shore. Thus every thing in nature is in strict alliance. The Fauns, the Dryads, and the Nereids, walk every where hand in hand.

What a charming spectacle would a botanical Zoology present? What unknown harmonies would be reflected from a plant to an animal, and from an animal to a plant! What picturesque beauties would appear! What relations of utility, of every species, contributing either to pleasure or to profit, would result from it! The introduction of a new plant into our fields, would be sufficient to allure a new set of songsters to our groves, and shoals of unknown fishes to the mouths of our rivers. Might it not be possible to increase even the family of our domestic animals, by peopling the glaciers of the lofty mountains of Dauphiné, and of Au-

* Vol. ii. chap. 22. page 350

vergne, with herds of rein-deer, an animal so valuable in the northern parts of Europe; or with the lama of Peru, who delights in the snows at the foot of the Andes, and whom Nature has clothed in the finest of wool? A little moss, a few rushes of their own country, would be enough to fix them in ours. *

Attempts have frequently been made, I admit, to propagate the breed of foreign animals in our parts, by observing even the choice of those species whose native climate came nearest to ours; but they all languish and die, because no care was taken to transplant them with their proper vegetable. You see them always restless, with the head hanging down, scratching up the ground, as if demanding from it the nourishment which they had lost. A single herb would have been sufficient to quiet them, by recalling the tastes of their early life, the breezes which used to fan them, the cool fountains and refreshing shades of their native country: less unhappy, however, than Man, who can be cured of regret only by the total loss of memory.

In the FIFTH PART, we shall speak of MAN. Every Work of Nature has presented to us hitherto only partial relations; Man will furnish such as are universal. We shall examine, first, those in which he stands to the Elements. Beginning with that of Light and Fire, we shall observe, that his eyes are turned, not towards Heaven, as the Poets, and even some

* There is much truth in these observations. In Saint-Pierre's acceptance of the word, the harmonies which subsist between plants and animals are certainly numerous, and highly interesting. How much would this amiable philosopher, have been delighted to have learned that a relation of this kind subsists between the beautiful Nelumbium, or great water-lily of America, and the most intelligent of all quadrupeds, the Beaver. The beaver is not only extremely fond of the root of this fragrant and specious plant, but it is a fact that he seems, on some occasions, to follow the migrations of the plant: that is, he forms new settlements in certain districts of country, into which the Nelumbium has been introduced, either by the curiosity of man, or by accident. I believe the rein-deer might be naturalized in climates very far to the south of those in which nature has placed it: even in Pennsylvania and Virginia. It would here find an abundance of mosses; and it is curious to observe, that one of the favourite plants of the animal, even in Greenland, is extremely common in many parts of the United States; I mean the *mittchella repens*, called by us, deer-berry, partridge-berry, turkey-berry, &c.—B. S. B.

Philosophers allege, but to the Horizon; so that he may view at once the Heaven which illuminates, and the Earth which supports him. His visual rays take in near half of the celestial Hemisphere, and of the plane on which he treads, and their reach extends from the grain of sand, which he tramples under foot, to the star which shines over his head, at an immeasurable distance.

He alone, of animals, can enjoy equally the day and the night; he alone can bear to live within the torrid zone, and upon the ices of the frigid. If certain animals are partakers with him in these advantages, it is only by means of his instructions, and under his protection. For all this he is indebted to the element of Fire, of which he alone is the Sovereign Lord. Some Authors pretend, that certain of the brute creation understand the management of it, and that the monkeys in America keep up the fires kindled by travellers in the forests. No one denies that they love it's heat, and resort to it for warmth, when Man retires. But as they have perceived it's utility, Why have they not preserved the use of it? However simple the manner of keeping up fire may be, by supplying it with fuel, not one of them will ever attain to that degree of sagacity.

The dog, much more intelligent than the monkey, a witness every hour of the effects of fire; accustomed, in our kitchens, to live only on meat that is dressed, if you give him raw flesh, will never dream of going to roast it on the coals. This barrier, which separates Man from the brute, weak as it may appear, is insurmountable to animals. And this is one of the great blessings of Providence, bestowed for the general security; for how many unforeseen and irreparable conflagrations would take place, were Fire at their disposal? God has intrusted the first agent in Nature, to that being alone who, by his reason, is qualified to make a right use of it.

While some Historians bestow this faculty on the brutes, others deny it to Man. They allege that many Nations were entirely destitute of it, till the arrival of the Europeans among them. To prove this, they quote the inhabitants of the Marianne Islands, otherwise called the Isle of Thieves, by a calumnious imputation so common among sailors. But this assertion is grounded on bare supposition; namely, on the very natural astonishment expressed by these Islanders, on

seeing their villages set on fire by the Spaniards,* whom they had received with kindness. They contradict themselves, at the same time, by relating, that these very people used canoes, daubed over with bitumen, which necessarily supposes, in the case of savages unacquainted with iron, that fire had been employed in the hollowing of their canoes, or at least in careening them. Finally, we are told, that they fed on rice, the preparation of which, however simple, requires of necessity the application of fire.

This Element is universally necessary to human existence, even in the hottest climates. By means of fire alone, Man guards his habitation by night from the ravenous beasts of prey: drives away the insects which thirst for his blood: clears the ground of the trees and plants which cover it, and whose stems and trunks would resist every species of cultivation, should he find means, any other way, to bring them down. In a word, in every country, with Fire he prepares his food, dissolves metals, vitrifies rocks, hardens clay, softens iron, and gives to all the productions of the Earth the forms and the combinations which his necessities require.

The benefits which he derives from the Air are no less extensive. Few animals are, like him, capable of respiring, with equal ease, at the level of the Sea, and on the summit of the loftiest mountains. Man is the only being who gives it all the modulations of which it is susceptible. With his voice alone, he imitates the hissing, the cries, the singing of all animals; while he enjoys the gift of speech, denied to every other. Sometimes he communicates sensibility to the Air; he makes it to sigh in the pipe, to complain in the flute, to threaten in the trumpet, and to animate to the tone of his passions, the brass, the box-tree, and the reed. Sometimes he makes it his slave; he forces it to grind, to bruise, and to move, to his advantage, an endless variety of machinery. In a word, he yokes it to his car, and constrains it to waft him even over the billows of the Ocean.

That Element, in which few of the inhabitants of Earth are able to live, and which separates their different classes, by a

* See the History of their Discoveries, by Magellan; the History of the Marianne Isles, by Father Gobien, vol. ii. page 44; and that of the West Indies, by Herrera, vol. iii. pages 10 and 712.

boundary more insurmountable than that of Climate, presents to Man alone the easiest of communications. He swims in it, he dives, he pursues the sea-monster to the abysses of the deep ; he hunts and stabs the whale even under mountains of ice ; and alights on every island in the bosom of the Sea, and asserts his empire over it.

But he had no need of that which he exercises over Air and Water, to render his sovereignty universal. He has only to remain on the Earth where he was born. Nature has planted his throne on his cradle. Every thing that lives comes thither to pay him homage. There is not a vegetable but what fixes it's roots under his feet, not a bird but there builds his nest, not a fish but there deposits her spawn.

Whatever irregularity may appear on the surface of his domain, he is the only being formed with the capacity of pervading all it's parts. And what, in this respect, excites the highest admiration, there is established among all his limbs an equilibrium so perfect, so difficult to be preserved, so contrary to the laws of our mechanism, that there is no Sculptor capable of forming a statue resembling Man, broader and heavier above than below, which shall be able to maintain an erect position, and remain immovable, on a basis so small as his feet. It would be quickly upset by the slightest breath of wind. How much more then would be requisite to make it walk like Man? There is no animal whose body is susceptible of so many different movements ; and I am tempted to believe, that he unites in himself all the possible varieties of animal motion, on seeing how he bends, kneels, creeps, slides, swims, tumbles himself into the form of an arch, rounds himself like a wheel, like a bowl, walks, runs, leaps, springs, mounts, descends, climbs ; in a word, how his frame is equally adapted to clamber to the summit of the rock, and to walk on the surface of the snow ; to traverse the river and the forest, to pick the moss of the fountain, and the fruit of the palm-tree ; to feed the bee, and to tame the elephant.

With all these advantages, Nature has collected in the human figure every thing that is lovely in colour and in form, whether from harmony or from contrast. To these she has added movements the most majestic and the most graceful. From an accurate observation of this, Virgil has been enabled to finish, by a

master-stroke, the portrait of Venus disguised, talking with Eneas, who remained ignorant who she was, while beauty only was displayed, but distinguished her the instant she began to move: *Vera incensu patuit Dea*; "Her gait declared the Goddess."*

The AUTHOR of Nature has united in Man every species of beauty, and has formed of these a combination so wonderful, that all animals, in their natural state, are struck, at sight of him, with love or with terror; this we shall demonstrate by more than one curious remark. Thus, too, is fulfilled the Word which conferred on him the original sovereignty of the World:† "And the fear of you, and the dread of you shall be upon every beast of the Earth, and upon every fowl of the Air, upon all that moveth upon Earth, and upon all the fishes of the Sea: into your hand are they delivered."

As he is the only being who has the disposal of Fire, which is the principle of life, so he alone practises Agriculture, which is its support. All frugivorous animals have, like him, occasion for it, most of them the experience, but no one the practice. The ox never thinks of resowing the grain which he treads out on the barn-floor, nor the monkey, the maize of the field which he plunders. We are presented with far-fetched theories of the relations which may subsist between brutes and Man, in the view of reducing them to a level, while the trivial differences are over-looked, which are continually before our eyes, and interpose between us and them an immeasurable interval, and which are the more wonderful, the more easy it appears to surmount the difficulty.‡

* Milton's description of Eve is still more characteristic of female majesty in motion :

Grace was in all her steps, Heaven in her eye ;
In every gesture, dignity and love,

Paradise Lost, book iv.

† Genesis, ix. 2.

‡ Certainly, the differences between brutes and man are numerous, and very great. No sound philosopher seriously attempts to reduce the former to a "level" with the latter. But it is a task not unworthy of philosophers, nay it is the duty of the philosopher, to endeavour to discover the "relations" which do actually subsist between the one and the other of these series of beings. And what will be the necessary result of all our inquiries on this subject? That man is, in many respects, allied to the family of animals :

Every one of the brute creation is circumscribed within a narrow sphere of vegetables, and of means necessary to gather them. No one extends his industry beyond its instinct, be its wants what they may. Man alone raises his intelligence up to that of Nature. He not only pursues her plans, but recedes from them. He substitutes others in their place. He covers regions destined for forests, with corn and wine. He says to the pine of Virginia, and to the chesnut of India, "You shall grow in Europe." Nature seconds his efforts, and seems, by her complaisance, to invite him to prescribe laws to her.

For him she has covered the Earth with plants, and though their species be infinite, there is not a single one but may be converted to his use. She has, first, selected some out of every class, to minister to his pleasure, or to his support, wherever he pleases to fix his habitation: from among the palm-groves of Arabia, the date; among the ferns of the Moluccas, the sago; among the reeds of Asia, the sugar-cane; among the solanums of America, the yam; among the lianne tribe, the vine; among the papilionaceous, the French bean and the pea; finally, the potatoe, the manioc, the maize, and an innumerable multitude of fruits, grains, and roots, proper for food, are distributed for him, in every family of vegetables, and over every latitude of the Globe. She permits the plants which are most useful to him to grow in all climates; the domestic plants, from the cabbage up to the corn, alone, like man himself, are citizens of the World. The others serve for his bed, for his roof, for his clothing, for medicine, at least for fuel. And, in order that there might be no one but what should contribute to the support of his life, and that the distance or ruggedness of the soil in which they grow might interpose no obstacle to his enjoyment of them, Nature has formed certain animals to seek them out for him, and to convert them to his use.

The animals are formed in the most wonderful manner, at once to live in situations the most rugged, and, animated by an instinct the most tractable, to associate with Man. The lama

that he holds alliances by structure, by functions, by passions, by instincts, by manners; that he differs from the brute chiefly in regard to the quantity of his instincts; and still more chiefly in the inestimable privilege of knowing his CREATOR, through the medium of his works, and through the medium of REVELATION.—B. S. B.

of Peru, with his forked feet, armed with two spurs, scrambles over the precipices of the Andes, and brings back to him his rose-coloured fleece. The rein-deer, with her broad and cloven hoof, traverses the snows of the North, and fills for him her dugs distended with cream, in the mossy pastures. The ass, the camel, the elephant, the rhinoceros, are detached on his service to the rocks, to the sands, to the mountains, and to the morasses of the torrid Zone. Every region is supporting a race of servants for him; the roughest, the most robust; the most patient, the most ungrateful.

But animals alone, in which are united the greatest number of utilities, live with him over the whole face of the earth. The sluggish cow pastures in the cavity of the valley, the bounding sheep on the declivity of the hill. The scrambling goat browses among the shrubs of the rock; the hog, armed with a snout, turns up the foundation of the marshy ground, with the help of an appendage of spurs, which Nature has planted above his heels, to prevent his sinking in it; the swimming duck feeds on the fluviatic plants; the hen, with attentive eye, picks up every grain scattered about, and lost in the field; the pigeon, on rapid wing, collects a similar tribute from the refuse of the grove, and the frugal bee turns to account, for the use of Man, even the small dust on the flower.

There is no corner of the Earth where the whole vegetable crop may not be reaped. Those plants which are rejected by one, are a delicacy to another; and even to the finny tribes, contribute to their fatness. The hog devours the horse-tail and hen-bane; the goat, the thistle and hemlock. All return, in the evening, to the habitation of Man, with murmurs, with bleatings, with cries of joy, bringing back to him the delicious tribute of innumerable plants, transformed, by a process the most inconceivable, into honey, milk, butter, eggs, and cream.*

* The goat devours, with impunity, various species of deleterious plants, such (besides the hemlock long since noticed by Lucretius, and now by Saint-Pierre) as the Jamestown-weed, or Stramonium (*datura stramonium*), the tobacco, and other *plantæ curide*. The common deer, (*Cervus Virginianus*) eats, and seems to fatten upon, the leaves of the Broad-leaved Kalmia (*Kalmia latifolia*); and the seeds of various species of poisonous plants are devoured and disseminated by the Passerin and other birds, to which they serve as *condiments*, if not as food. There is then, no extravagance in this part of our author's work. *Every plant is useful*. That which we neglect,

Man subjects to his dominion, not only the whole vegetable, but the whole animal creation, though their smallness, their swiftness, their strength, their cunning, nay, the very Elements, may seem to exempt them from his jurisdiction.

To begin with the infinite legions of insects: his duck and his hen feed upon them. These fowls swallow even various sorts of venomous reptiles, without sustaining the slightest injury. His dog subdues for him every other species of brute. The numerous varieties of that animal are evidently adapted to their several uses and ends; the shepherd's dog, for the wolf; the terrier, for the fox; the grey-hound, for animals of the plain; the mastiff, for those of the mountain; the pointer, for birds; the water-spaniel, for the amphibious race; in a word, from the little lap-dog of Malta, formed only for amusement, up to the huge hunter of the Indies, who, according to Pliny and Plutarch, scorns to attack any thing inferior to the lion or the elephant, and whose breed still subsists among the Tartars, their species are so varied in form, in size, in respect of instinct, that I am constrained to believe Nature has produced as many sorts of them, as she has produced animal species to be subjugated. We cross the breed of cats, of goats, of sheep, of horses, a thousand different ways; and after all our efforts and combinations, we can produce only a few trivial varieties, which deserve in no respect to be compared with the natural varieties of the canine species.

While some Philosophers assign to every species of dog a common origin, others ascribe a difference of origin to Man. Their system is founded on the variety of size and colour in the human species; but neither colour nor stature are distinctive characters, in the judgment of all Naturalists. According to them, colour is merely accidental; superior stature only a greater expansion of forms. Difference of species arises from the difference of proportions: now this characterizes that of dogs.

or weed up, and throw away, as useless or pernicious, is only useless or pernicious, relatively considered. The seed of the Fox-Glove and Stramonium kill turkeys and other species of birds: but these plants fatten some species of animals, and are inestimable agents in the hands of physicians, as remedies for the cure of various diseases. The time will come, and all the well-directed efforts of science are fast hastening this period, when one of the best defences of Provident nature will be offered to us, by the cultivators of rational Botany.—B. S. B.

The proportions of the human body no where vary ; the black colour within the Tropics is simply the effect of the heat of the Sun, which tinges him in proportion as he approaches the line. And it is, as we shall see, one of the blessings of Nature. His size is invariably the same in every age, and in all places, notwithstanding the influence of food and climate, by which other animals are so powerfully affected. There are breeds of horses and of black cattle, double the size the one of the other, as any one may be convinced, by comparing the large artillery horses of Holstein with the small poneys of Sardinia, no taller than sheep ; and the huge Flanders ox with the diminutive one of Bengal ; but from the tallest to the shortest of the human race, there is not at most the difference of a foot. Their stature is the same at this day as it was in the time of the Egyptians ; and the same at Archangle as in Africa, as is evident from the length of mummies, and that of the tombs of the ancient Indians found in Siberia along the banks of the river Petzora.

The somewhat contracted stature of the Laplanders is to be imputed, I presume, to their sedentary mode of living ; for I have observed among ourselves a similar contraction of size in persons of certain occupations, which require little exercise. That of the Patagonians, on the contrary, is more expanded than that of the Laplanders, though they inhabit a latitude as cold, from their greater disposition to be moving about. The Laplander passes the greater part of the year shut up amidst his herds of rein-deer ; whereas the Patagonian is perpetually a stroller, for he lives entirely by hunting and fishing. Besides, the first travellers to whom we are indebted for our knowledge of these two nations, have greatly exaggerated the smallness of the one, and the magnitude of the other, because they saw the Laplanders squatted on the floor of their smoky huts ; and the Patagonians in a position which magnifies every object, namely, at a distance, on the summit of their rocky shores, whither they flock as soon as a vessel appears, and through the fogs which are so frequent in their climates, and which it is well known greatly increase the apparent size of all bodies, especially when in the Horizon, by refracting the light wherewith they are surrounded.

The Swedes and Norwegians, who inhabit similar latitudes, in which the cold prevents, as it is alleged, the expansion of the

human body, are of the same stature with the natives of Senegal, where the heat, for the opposite reason, ought to favour growth; and neither the one nor the other is taller than we are. Man over the whole Globe is at the centre of all magnitudes, of all movements, and of all harmonies. His stature, his limbs, his organs, have proportions so adjusted to all the works of Nature, that she has rendered them invariable as their combination. He constitutes himself alone a genus which has neither class nor species, dignified, by way of excellence, with the title of MAN-KIND.

He forms a real family, all the members of which are scattered over the face of the Earth, to collect her productions, and are capable of containing a most wonderful correspondence, adapted to their mutual necessities. Man has been in every age the friend of Man, not merely from the interests of commerce, but by the more sacred, the more indissoluble bands of Humanity. Sages appeared two or three thousand years ago in the East, and their wisdom is now illuminating us at the remotest verge of the West. To-day a savage is oppressed in the wilds of America; he sends his arrow round from family to family, from nation to nation, and the flame of war is kindled in the four quarters of the Globe. We are all bondsmen for each other.

We shall frequently recur to this great truth, which is the basis of the morality of Subjects as well as of Sovereigns. The happiness of every individual is attached to the happiness of Mankind. He is under obligation to exert himself for the general good, because his own depends upon it. But interest is not the only motive which renders virtue a duty to him; to Nature he is indebted for its sublimest lessons. Being born destitute of instinct, he was laid under the necessity of forming his intellect on her productions. He could imagine nothing but after the models of every kind with which she had presented him. He was instructed in devising and perfecting the mechanic Arts, from plans suggested by the industry of animals; and in the liberal Arts and Sciences, after the model of Nature's own immediate harmonies and plans. To her sublime studies he is indebted for a light which illumines no other animal. Instinct discovers to the animal its necessities only; but Man alone has

raised himself from the dark womb of profound ignorance, to the knowledge and belief of a GOD.

This knowledge has not been confined to a Socrates, or a Plato ; No, they have it in common with Tartars, Indians, Savages, Negroes, Laplanders ; with men of every description. It is the result of every contemplation, whatever be the object, of a grain of moss, or of the Sun. On it are founded all the associations of the human race, without a single exception.

As Man has formed his intellect on that of Nature, he has been obliged to regulate his moral sense by that of her AUTHOR. He felt that in order to please Him who is the principal of all good, it was necessary to contribute to the general good ; hence the efforts made by Man in every age to raise himself to GOD by the practice of virtue. This religious character, which distinguishes him from every other sensible being, belongs more properly to his heart than to his understanding. It is in him not so much an illumination as a feeling, for it appears independent even of the spectacle of Nature, and manifests itself with equal energy in those who live most remote from it, as in those who are continually enjoying it. The sensations of the infinity, of the universality, of the glory, and of the immortality with which it is connected, are incessantly agitating the inhabitants of the city, as well as those of the country. Man, feeble, miserable, mortal, indulges himself every where in these celestial passions. Thither he directs without perceiving it, his hopes, his fears, his pleasures, his pains, his loves ; and passes his life in pursuing or in combating these fugitive impressions of DEITY.

Such is the career which I have prescribed to myself. But as on a long voyage we sometimes perceive on our way flowery isles in the bosom of a great river, and enchanting groves on the summit of inaccessible precipices ; in like manner, the progress we shall make in the study of Nature, will gradually disclose to us some delightful prospects. With these we shall at least feast the eye as we pass along, if we are not permitted to stop and survey them at leisure. We shall have frequent occasion to remark, that the works of Nature exhibit contrasts, harmonies, and transitions, which wonderfully unite their different empires to each other.

We shall examine by what magic it is that the contrasts are productive at once of pleasure and pain, of friendship and ha-

tred, of existence and destruction. From them proceeds that great principle of LOVE, which divides all the individuals into two great classes, objects loving, and objects beloved. This principle extends from animals and plants, which are distinguished by sex, down to insensible fossils; as metals, which have magnetic powers, most of which are still unknown to us; and from salts which strive to unite in the fluids where they swim, up to the Globes which have a mutual attraction in the Heavens. It opposes individual to individual by difference of sex, and genus to genus by difference of forms, in order to extract from them harmonies innumerable.

In the Elements, Light is opposed to Darkness, Heat to Cold, Earth to Water, and their accords produce lights, temperatures, views, the most agreeable. In vegetables we shall see, in the forests of the North, the thick and gloomy foliage, the tranquil attitude, and the pyramidical form of the fir, contrast with the tender verdure and moveable foliage of the birch, which, from it's spreading top and slender base, presents the appearance of a pyramid inverted. The forests of the South will exhibit similar harmonies, and we shall find them even in the herbage of our meadows.

The same oppositions reign in the animal kingdom; and to instance only in such as are most familiar to us, the bee and the butterfly, the hen and the duck, the indigenous sparrow and rambling swallow, the nimbler courser and sluggish ox, the patient ass and capricious goat, in a word, the cat and the dog, display an endless contrast on our flower-beds, in the meadow, in our houses, of forms, of movements, of instincts.

I do not comprehend in these harmonical oppositions the carnivorous animals, which make war on the others, and whose corresponding intercourse regards them not as living, but as dead. I understand by contrast, that which Nature has established between two classes, different in manner, in inclinations, and in figures, and to which nevertheless she has given certain secret sympathetic sensibilities, which engage them in their natural state to inhabit the same places, to associate together, and to live in peace. Such is the contrast of the horse, who delights to gallop about in the same field where the ox walks gravely on, ruminating as he goes. Such again is that of the ass, who well-pleased follows, with a slow and measured pace,

the nimble-footed goat up to the very precipices over which she scrambles. From the bee and the butterfly, up to the elephant and the camelopard, there is not a single animal on the Earth but what has it's contrast, Man only excepted.

The contrasts of Man are all within himself. Two opposite passions, Love and Ambition, balance all his actions. To Love, are referable all the pleasures of the senses; to Ambition, all those of the soul. These two passions are in perpetual counterpoise in the same subject; and while the first is accumulating on Man every kind of corporeal enjoyment, and insensibly sinking him below the level of the beasts; the second prompts him to aim at universal dominion, and to exalt himself at length up to the DEITY. These two contradictory effects are observable in all men who have it in their power, without obstruction, to follow these opposite impulses, whether in the class of Kings or that of slaves. The *Neros*, the *Caligulas*, the *Domitians*, lived like brutes, and exacted the adoration due to Gods. We find in Negroes the same incontinence, the same pride, and the same stupidity.

Nature, however, has bestowed these two passions on Man as a source of happiness. She produces an equal number of each sex, in order to direct the love of every man to a single object, and in that object she has united all the harmonies which are scattered over her most beautiful productions. There is between Man and Woman a wonderful analogy of forms, of inclinations, and of tastes; but there is a difference still greater of these very qualities. Love, as we shall have occasion to observe, results only from contrasts, and the greater they are the more powerful is it's energy. I could easily demonstrate this, by the evidence of a thousand historical facts. It is well known for example, with what a mad excess of passion that tall and clumsy soldier *Mark Antony* loved and was beloved by *Cleopatra*; not the person whom our Sculptors represent of a tall, portly, sabine figure, but the *Cleopatra* whom Historians paint as little, lively, sprightly, carried in disguise about the streets of Alexandria in the night-time, packed up in a parcel of goods on the shoulders of *Apollodorus* to keep an assignation with *Julius Cæsar*.

The influence of contrasts in Love is so certain, that on seeing the lover it would be easily possible to draw the portrait of

the beloved object without having seen it, provided only it were known that the passion was extremely violent. Of this I myself have made proof on various occasions : among others, in a city where I was entirely a stranger. A gentleman of the place, one of my friends, carried me to visit his sister, a very virtuous young lady, and he informed me as we were going that she was violently in love. Being arrived at her apartments, and Love happening to become the subject of conversation, it came into my head to say to her that I knew the laws which determined our choice in love, and that if she would permit me I could draw her lover's picture, though he was utterly unknown to me. She bid me defiance : upon this, taking the opposite to her tall and buxom figure, to her temperament and character, which her brother had been describing to me, I painted her favourite as a little man not overloaded with flesh, with blue eyes and fair hair, somewhat fickle, eager after information. Every word I uttered made her blush up to the eyes, and she became seriously angry with her brother, accusing him of having betrayed her secret. This however was not the case, and he was fully as much astonished as herself.

These observations are of more importance than we generally imagine. They will enable us to demonstrate to what a degree our Institutions deviate from the Laws of Nature, and weaken the power of Love, when they assign to Woman the studies and the employments of Man. Virtue alone knows how to turn these contrasts to good account in the married state, in which the duties of the two sexes are so very different. There too she presents to their natural ambition a career the most sublime in the education of her children, whose reason it is their duty to form ; and their sweetest recompense to receive in exchange the first sentiments of filial affection. In the hearts of their children their memory is to be perpetuated on the earth, in a manner more affecting and infinitely more indelible than the memory of Kings on public monuments. What power can equal that which confers existence and the power of thought ; and what recollection can last so long as that of filial gratitude ?

The government of a good King has been compared to that of a Father ; but the empire of a virtuous Father can be compared only to that of God himself. Virtue is to Man the true

law of Nature. It is the harmony of all harmonies. Virtue alone can render Love sublime and Ambition beneficent. It can derive the purest gratification even from privations the most severe. Rob it of Love, Friendship, Honour, the Sun, the Elements, it feels that under the administration of a Being just and good, abundant compensation is reserved for it, and it acquires an increase of confidence in GOD even from the cruelty and injustice of Man. It was virtue that supported in every situation of life an *Antoninus*, a *Socrates*, an *Epictetus*, a *Fenelon*; that rendered them at once the happiest and the most respectable of Mankind.

If on the one hand Nature has established contrasts in all her works, on the other she has deduced from them harmonies which re-unite them all again. It would appear that having fixed upon a model, it was her intention to communicate to all places a participation in it's beauty. The light and disk of the Sun are accordingly reflected a thousand different ways by the planets in the heavens, by the parhelions and rainbow in the clouds, by the *Aurora-borealis* in the ices of the North; in a word, by the refractions of the Atmosphere, the reflexes of the waters, and the specular reflexions of most bodies on the Earth. The islands in the midst of the Ocean represent the mountainous forms of the Continent; and the mediterranean Seas and Lakes in the bosom of mountains represent the vast plains of the mighty Deep.

Trees in the climate of India affect the port of herbs; and the herbs in our gardens that of trees. A multitude of flowers seem modelled after the rose and the lily. Among our domestic animals the cat appears to be formed on the model of the tyger, the dog on that of the wolf, the sheep on that of the camel. Every species has it's correspondent, Mankind only excepted. That of the monkey, which some would make a variety of the human species, has relations much more direct to other animals. The man of the woods, with his long arms, his meagre feet, his fleshless paws, his flattened nose, his lipless mouth, his round eyes, his abominable hairy coat, has certainly a very imperfect resemblance to the Apollo of the Vatican; and whatever inclination one might have to reduce Man to the beast, it would be difficult to find in the female of that animal, a second model of the human figure, which should come near

the Venus de Medicis, or the Diana of Allegrain, which is shewn at Lucienne. But I have seen monkeys which had a strong resemblance to the bear, as the bavian of the Cape of Good Hope ; or to the greyhound as the Maki of Madagascar. Some are formed like little lions ; such is a very handsome white species with a mane found in Brasil. I presume that most species of quadrupeds, especially among the ferocious kinds, have their counterparts in those of the monkey tribe.

These same correspondencies are likewise discernible in the numerous variety of parrots, which in their forms, their bills, their claws, their scream, and their sports, imitate for the most part birds of prey. Finally, they extend even to the plants, denominated for this reason *mimosas*, which represent in their flowers, or in the aggregation of their grains, insects and reptiles, such as snails, flies, caterpillars, lizards, scorpions, and so on.

Nature in forming and presenting these correspondencies must have some intention which I do not comprehend. What is very remarkable, they are common only between the Tropics, where the forests swarm with every species of the monkey and parrot race. Perhaps she meant to exhibit under harmless forms those of the noxious animals which are there found in great numbers, in order to expose to the light of day the terrible figure of those sons of darkness and carnage, and that none of her productions should remain concealed in the womb of Night from the eyes of Man.

Whatever may be in this, no one animal on the face of the Earth is formed on the noble proportions of the human figure ; and if Man under the impulse of passion frequently degrades himself to the level of the beasts, his restlessness, his intelligence, and his sublime affections sufficiently demonstrate that he himself is the counterpart of the DEITY.

Finally, the spheres of all beings have a communication by means of rays which seem to unite their extremities. We shall remark in the stalactites and chrysalizations of fossils, the processes of vegetation ; and I think we may perceive even the movement of animals in that of their magnetic influence. On the other hand, we shall see plants forming themselves after the manner of fossils without any apparent organization ; such is, among others, the truffle, which has neither leaves, nor flowers, nor roots. Others represent in their flowers the figure

of animals, as the orchites ; or their sensibility, as the sensitive plant, which lets fall and shuts it's leaves at the slightest touch ; or their instinct, as the *dionæa muscipula*, which catches flies. The petals of this plant are formed of opposite little leaves, impregnated with a sugary substance which attracts the flies ; but the instant they alight, these little leaves suddenly close together with a spring, like the jaws of a fox-trap, and pierce the fly with their prickly edges.

There are others still more astonishing, as having within themselves the principle of motion ; such is the *hedysarum movens*, or *burum chandali*, imported some years ago from Bengal into England. This plant moves alternately the two pendent lobes which are attached to it's leaves, though no exterior or apparent cause contributes to this species of oscillation.*

But without going so far in quest of wonders, we shall find perhaps in our common gardens appearances of Nature still more surprizing. We shall see the pea, for example, pushing out it's tendrils precisely at the height where they begin to stand in need of support, and curling them round the boughs with an address which can hardly be ascribed to chance. These relations seem to suppose intelligence ; but we shall find others still more amiable, which are a demonstration of goodness not in the vegetable but in the hand which formed it. The *sylyphium* of our gardens is a great ferulaceous plant, which resembles on the first glance what is known by the name of the sun-flower. It's capacious leaves are opposed at the base, and their cavities uniting form an oval cup, in which the rain-water collects to

* The *burum chandali*, here spoken of, is the plant called by Linnæus, *hedysarum gyrans*. It is a native of the country along the Ganges, in India. " It has trifoliate leaves, of which the central one is larger than the two others. All these leaves move spontaneously ; the large one rises backward up and down, the two smaller leaves at the sides have the same movement, only somewhat stronger. Laying hold of these leaves, and then removing the hand, quickens their motions, as if they were to make up for the lost time, till at last they return to their former slower motion. No particular stimulus seems to act on them, and they do not contract, like other irritable plants. Nor does this motion of the leaves depend on sun-light, for they move in light as well as in the dark, even when the leaves are perfectly asleep. It is besides remarkable, that the leaves in the height of erection, and during very warm but serene days, like the animal muscular fibre, shew a tremulous motion.—B. S. B.

the quantity of a pretty large glass-full. They are placed in stories, not in the same direction, but at right angles, in order to receive the rain-water that falls in the whole extent of their circumference. It's square stem is very commodious for being firmly caught by the claws of birds; and it's flowers produce seeds of which many of them are excessively fond, particularly the thrush. So that this whole plant, like the perch of a parrot-cage, presents at once to the birds a resting-place and meat and drink.

We shall likewise speak of the smell and taste of plants. We shall remark under these relations a great number of botanical characters which are not the least certain. It was from the smell and taste that Man acquired the first knowledge of their poisonous, medicinal, or nutritive qualities. Nay, the very sounds of plants are not to be overlooked; for when agitated by the winds most of them emit sounds peculiar to themselves, and which produce harmonies or contrasts the most agreeable with the sites of the places where they usually grow. In India the hollow canes of the bamboo which shade the banks of rivers imitate, as they rustle against each other, the gushing noise excited by the motion of a ship through the water; and the pods of the cinnamon agitated by the winds on the mountain's top, the tic-tac of a mill. The moveable leaves of the poplar convey to our ears in the wood the bubbling of a brook. The green meadows and the calm forests fanned by the zephyrs represent in the hollow of the valley, and on the declivity of the rock, the undulations and murmurs of the waves of the sea breaking on the shore. The early inhabitants of the Globe, struck with these mysterious sounds, imagined that they heard oracles pronounced from the trunk of the oak, and that Nymphs and Dryads inclosed in the rugged bark, inhabited the mountain of Dodona.

The sphere of animals extends still farther these wonderful harmonies. From the motionless shelly race, which pave and strengthen the capacious bed of the Sea, to the fly who wings his way by night over the plains of the torrid Zone, glittering with rays of light like a star, you will find in them the configuration of rocks, of vegetables, of stars. A thousand ineffable passions, a thousand instincts animate them, which they express

in songs, in cries, in hummings, nay, even in the articulate sounds of the human voice.

Some of them compose noisy republics, others live in a profound solitude. The whole life of some is employed in waging war, that of others in making love.

In their combats they use every imaginable species of armour, and every possible method of availing themselves of the weapons with which Nature has furnished them, from the porcupine, who darts his pointed arrows at the foe, to the torpedo, who invisibly smites his assailant as with a stroke of electricity.

Their loves are not less varied than their animosities. One must have his seraglio; another is satisfied with a transient mistress; a third unites himself to a faithful companion, whom he never abandons till death makes the separation. Man unites in his enjoyments their pleasures and their transports; and, satiated, sighs and demands of Heaven felicity of a different kind.

We shall examine simply by the light which reason supplies, whether Man subjected by his body to the condition of the animal creation, all whose necessities he unites in himself, is not by his soul allied to creatures of a superior order: whether Nature, who has assigned the jurisdiction of the immensity of her productions on the Earth to a being naked, destitute of instinct, and who must undergo an apprenticeship of several years in learning to walk only, has reduced him from his birth to the alternative of studying their qualities or of perishing; and whether she has not reserved to herself some extraordinary means of interposing for his relief amidst the evils of every kind which checker his existence, even among beings of the same species with himself.

On reviewing the transitions which unite the different kingdoms, and which extend their limits to regions hitherto unknown, we shall not adopt the opinion of those who believe that the works of Nature being the results of all possible combinations, must present every possible mode of existence. "You will find in them, say they, order, and at the same time disorder. Throw about the characters of the alphabet in an infinite variety of manners, and you shall form of them the *Iliad*, and poems superior even to the *Iliad*; but you will have at the same time an infinity of formless assemblages." We adopt this comparison, observing however that the suppo-

sition of the twenty-four letters of the alphabet suggests a previous idea of order, which it was necessary to admit as a foundation even to the hypothesis of chance. If then the multiplied throws of these twenty-four letters gave in fact an infinite number of poems good and bad, how many must principles much more numerous of existence in itself, such as the elements, colours, surfaces, forms, depths, movements, produce of different modes of existing, were we to take but a single hundred of the modifications of each primordial combination of matter!

We should have at least the general transitions of the different kingdoms. We should see plants walking on foot like animals; animals fixed in the earth by roots like plants; rocks with eyes; herbs which vegetated only in air. The chief intervals of the spheres of existence would be filled up. There exists nothing but what is useful relatively to Man. The same order which pervades the general combination of the spheres, subsists in the parts of each of the individuals which compose them. There is not a single one which has in its organs either deficiency or redundancy.

Their mutual adaption is so perceptible, and they possess characters so very striking, that if you were to shew to a Naturalist of ability any representation of a plant or of an animal which he had never seen, he could tell from the harmony of it's parts whether it were a creature of the imagination, or a copy after Nature. One day the students in Botany, wishing to put to trial the knowledge of the celebrated *Bernard de Jussieu*, presented to him a plant which was not in the collection of the Royal Garden, requesting him to indicate it's genus and species. The moment he cast his eyes on it, he replied "This plant is artificially composed; you have taken the leaves of one, the stalk of another, and the flower of a third." This was the fact. They had, however, selected with the greatest art the parts of such as had the most striking analogy.

I am confident to affirm, that by the method which I shall propose the Science may be carried still much farther, and that we shall be enabled by it to determine, at the sight of an unknown plant, the nature of the soil in which it grew; whether it is a native of a hot or cold country; whether it is an inhabi-

tant of the mountain or of the stream; and perhaps even the animal species to which it is particularly allied.

In studying these laws, most of which are unknown or neglected, we shall reject others which are founded only on particular observations, and which have been too much generalized. Such are, for example, the following; that the number and fecundity of created beings are in the inverse ratio of their magnitude; and that the time of their decay is in proportion to that of their increase. We shall shew that there are mosses less prolific than the fir, and shell-fish less numerous than whales: such is, to name only one, the hammer-fish. There are animals which grow very fast, and decay very slowly: this is the case of most fishes. I should never have done, if I went about to prove that the longevity, the strength, the size, the fecundity, the form of every being, is adapted in a most wonderful manner not only to it's individual happiness, but to the general happiness of all, from which results that of Mankind.

We shall likewise reject those analogies so commonly admitted, which are drawn from climate and soil, in order to explain all the operations of Nature by mechanical causes; for I shall demonstrate that she frequently produces in these both vegetables and animals, whose qualities are diametrically opposite to those of their climate and soil.

The tubulous and driest plants, such as reeds, rushes, as well as the birch, whose bark, similar to leather overlaid with oil, is incorruptible by humidity, grow by the water sides, like boats provided for crossing over. On the contrary, plants with the richest juices, and the most humid, grow in the driest situations, such as the aloe, the taper of Peru, and the lianne impregnated with water; which are to be found only on the parched rocks of the torrid Zone, where Nature has placed them like so many vegetable fountains.

Even the instincts of animals appear to be less adapted to their own personal utility, than to that of Man; and are sometimes in harmony with the nature of the soil which they inhabit, and sometimes in opposition to it. The gluttonous hog delights to live in the mire, from which he is intended to purify the habitation of Man; and the sober camel, to force his way through the burning sands of Africa, impervious but for him to every effort of the traveller. The appetites of these ani-

imals do not grow out of the places which they inhabit; for the ostrich, who is a fellow-tenant of the same desert with the camel, is still more voracious than the hog.

No one law of magnetism, of gravity, of attraction, of electricity, of heat, or of cold, governs the world. These pretended general laws are nothing more than particular means. Our Sciences mislead us, by ascribing to Nature a false providence. They put the balance into her hand, it is true, but not of justice; no, it is only the balance of commerce. They weigh only the salts and the masses, but put aside the wisdom, the intelligence, and the goodness. They are not afraid of excluding from the heart of Man that sentiment of the divine qualities, which communicates to him so much force; and of accumulating on his mind the weights and movements which oppress him. They put in opposition the squares of times and velocities, but they neglect those wonderful compensations with which Nature interposes for the relief of all beings, having bestowed the most ingenious on the most feeble, the most abundant on the poorest, and having united all for the relief of the Human Race, undoubtedly as being the most wretched species of all.

We can know that only which Nature makes us feel; and we can form no judgment of her works but in the place, and at the time she is pleased to display them. All that we imagine beyond this, presents only contradiction, doubt, error, or absurdity. I do not except from this description even our imaginary plans of perfection. For example, it is a tradition common to all Nations, supported by the testimony of the Holy Scriptures, and founded on a natural feeling, that Man has lived in a better order of things, and that we are destined to another, which is still to surpass it. We are incapable, however, of saying any thing of either the one or the other. It is impossible for us to retrench any thing from that in which we live, or to add any thing to it, without rendering our condition worse. Whatever Nature has introduced into it is necessary. Pain and death are among the proofs of her goodness. But for pain, we should be bruising ourselves every step we took without perceiving it. But for death, new beings could not be raised into existence; and supposing those which already are in the world could be rendered eternal, that eternity would involve in it the ruin of generations, of the configuration of

the two sexes, and of all the relations of conjugal, filial, and parental affection; that is to say, of the whole system of actual happiness.

In vain do we search in our cradles for the archives which our tombs deny us: the past, like the future, covers our mysterious destiny with an impenetrable veil. In vain do we apply to it the light which illumines us, and seek in the origin of things the weights, the times, and the measures, which we find in their enjoyment; but the order which produced them has with relation to God neither time, nor weight, nor measure. The divisions of matter and time were made only for circumscribed, feeble, transient Man. The universe, said *Newton*, was produced at a single cast. We are seeking for youth in what was always old, for old age in what is always young, for germs in species, births in generations, epochs in nature; but when the sphere in which we live issued from the hand of it's divine AUTHOR, all times, all ages, all proportions, manifested themselves in it at once.

In order that Etna might vomit out it's fires, from the very first construction of those tremendous furnaces, lavas must have been provided which had not yet begun to flow. In order that the Amazonian river might still roll it's streams across America, the Andes of Peru must have been from the beginning covered with the snows which the winds of the East had not yet accumulated upon them. In the bosom of new-created forests ancient trees must have sprung up, that insects and birds might find their proper aliment on the antique rind. Carrion must have been created for the support of carnivorous animals. There must have been produced in all the kingdoms of Nature beings young, old, living, dying, and dead. All the parts of this immense fabric must have appeared at the same instant; if there was a scaffolding, to us it has disappeared.

Let others extend the boundaries of our Sciences, I shall consider myself as having rendered a more useful service to my fellow-creatures, if I am enabled to fix those of our ignorance. Our illumination, like our virtue, consists in descending: and our force in becoming sensible of our feebleness. If I do not pursue the road which Nature has reserved for herself, I shall at least walk in that which Man ought to take. It is the only

one which presents him easy observations, useful discoveries, enjoyments of every description, without instruments, without a cabinet, without metaphysics, and without system.

In order to be convinced how agreeable it is, let us construct, in conformity to our method, any group, with the sites, the vegetables, and the animals, most commonly to be found in our Climates. Let us suppose a soil the most obdurate, a craggy protuberance on the coast, where a river disgorges itself into the Ocean, presenting a step toward the sea, and a gentle declivity toward the land: that on the side turned toward the sea the billows cover it with foam, it's rocks clothed with sea-weed, fucuses, alga-marinas of all colours, and of all forms, green, brown, purple, in tufts and garlands, as I have seen them on the coasts of Normandy, affixed to the rocks of white marl, which the sea detaches from the main shore. Let us farther suppose, that on the side of the river we see on the yellow sand a scanty verdure, mixed with a little trefoil, and here and there a sprig of marine wormwood. Let us introduce some willows, not like those which grow in our meadows, but the native crop of the soil, and similar to those which are to be seen on the banks of the Sprée, in the vicinity of Berlin, with broad bushy tops, and rising to the height of more than fifty feet. Let us not forget in this arrangement, the harmony of different ages, which it is so agreeable to meet in every species of aggregation, but especially in that of vegetables. Let us observe, of those willows so smooth and full of moisture, some pushing their young branches into the air, and others of an aged form with pendent top and hollow trunk.

Let us add to these their auxiliary plants, such as the green mosses and gilded *lichen*, which marble their grey rind, and some of the convolvuluses, vulgarly called lady's-smock, which delight to scramble along their trunk, and to embellish the branches, which have no flowers of their own, with leaves in form of a heart, and flowers white as snow, hollowed into the shape of a spire. Let us, finally, introduce the inhabitants natural to the willow, and it's accessory plants, their butterflies, their flies, their beetles, and other insects, together with the feathered animals which make war on them, such as the water-hen, polished like the burning steel, which catches them in the air; the wag-tail, which pursues them on the land, making the movement

from which he derives his name; and the king's-fisher, who hunts for them along the surface of the water; and you will see a multitude of agreeable harmonies arising out of one single species of tree.

They are however still imperfect. To the willow let us oppose the alder, which likewise affects the bank of the river, and which by it's form resembling that of a long tower, it's broad foliage, it's dusky verdure, it's fleshy roots, formed like cords running along the banks, and binding together the soil, forms a complete contrast with the extended mass, the light foliage, the white-streaked verdure, and the trundling roots of the willow. Add to this the individuals of the alder, of different ages, rising like so many verdant obelisks, with their parasite plants, such as the maiden-hair spreading into stars of verdure over the humid trunk, the long hart's-tongue hanging from the bows down to the ground, and the other accessories of insects and fowls, and even of quadrupeds, which probably contrast as to form, colour, gait and instinct, with those of the willow; and we shall have a delicious concert of vegetables and animals, composed of two trees only, together with their accompaniments.

If we illuminate our little plantation with the first rays of Aurora, we shall behold at once shades deep and shades transparent diffused over the verdure; a dusky and a silvered verdure intersect each other on the azure of the Heavens, and their soft reflexes blended together moving along the bosom of the waters. Let us farther suppose, what neither poetry nor painting can pretend to imitate, the odour of the plants, and even the smell of the sea, the rustling of leaves, the humming of insects, the matin-song of the birds, the hollow murmuring noise, intermixed with silence, of the billows breaking on the shore, and the repetitions of all these sounds, repercussed by the distant echoes, which losing themselves in the sea, resemble the voice of the Nereids: Ah! if Love or Philosophy should ever tempt you to such a solitude, you will find in it an asylum more delicious than the palaces of kings can bestow.

Would you wish that sensations of a different order should be excited? Would you wish to hear the voice of passion and sentiment burst from the bosom of the rock? Let the tomb of

a virtuous and unfortunate man start up amidst the weeping willows, presenting this inscription to the eye :—*Here rests J. J. ROUSSEAU.*

Would you wish to strengthen the impression of this picture, without however doing violence to Nature as to the subject ? Change the time, the place, the monument ; let this isle be Lemnos ; the trees of these groves, laurels and wild olives, and this tomb the tomb of *Philoctetes*. Look at the grotto, which served as a habitation to that great man when abandoned by the Greeks, whose battles he had fought ; his wooden pot, the tatters in which he was clothed, the bow and arrows of Hercules, which in his hands had subdued so many monsters, and with which he at last wounded himself : and you will be impressed with two powerful sensations at once, the one physical, which increases in proportion as you approach the works of Nature ; because their beauty discloses itself only to the eye which examines it ; the other moral, which grows upon you in proportion as you retire from the monuments of Virtue, because to do good to men, and to be no longer within their reach, is a resemblance to the DEITY.

What would it be then were we to take a glance of the general harmonies of this Globe ? To dwell only on those which are best known to us, behold how the Sun constantly encircles with his rays one half of the earth, while Night covers the other with her shade. How many contrasts and concords result from their ever-changing oppositions ? There is not a single point in the two Hemispheres in which there does not appear by turns a dawn, a twilight, an aurora, a noon, a setting of burnished gold, and a night sometimes studded with stars, sometimes clothed in a sable mantle.

The Seasons walk hand in hand under his eye, like the hours of the day. Spring, crowned with flowers, precedes his flaming car ; Summer surrounds it with her golden sheaves ; and Autumn follows it bearing her cornucopia running over with glossy fruit. In vain would Winter and Night, retiring to the Poles of the World, attempt to set bounds to his majestic career : In vain do they raise out of the bosom of the polar Seas of the North and of the South new Continents with their vallies, their mountains, and their icy corruscations : the Father of Day, with his fiery shafts, overturns the fantastic fabric ; and without

descending from his throne, resumes the empire of the Universe. Nothing can screen itself from his prolific heat.

From the bosom of the Ocean he raises into the Air the rivers which are afterwards to flow through the Old and New Worlds. He gives commandment to the Winds to distribute them over islands and continents. These invisible children of the Air transport them from place to place under a thousand capricious forms. Sometimes they are spread over the face of Heaven, like veils of gold and streamers of silk ; sometimes they are rolled up in the form of frightful dragons, and roaring lions, vomiting out torrents of fire and thunder. They pour them out on the mountains in as many different ways, in dews, in rains, in hail, in snow, in impetuous torrents.

However extravagant the mode of performing their services may appear, every part of the Earth annually receives from them neither more nor less than it's accustomed portion of water. Every river fills his urn, and every Naiad her shell. In their progress they impress on the liquid plains of the Sea the variety of their characters. Some hardly ruffle the smooth expanse ; others swell it into billows of azure ; and others turn it from the bottom with a dreadful noise, and dash it foaming over the rocky promontory.

Every place possesses harmonies peculiar to itself, and every place presents them in rotation. Run over at pleasure a Meridian or a Parallel, you will find on it mountains of ice and mountains of fire ; plains of every kind of level, and hills of every curve ; islands of all forms, and rivers of all currents ; some spouting out, as if they issued from the centre of the Earth, others precipitating themselves down in cataracts, as if they were descending from the clouds. Nevertheless this Globe, agitated with such a variety of convulsive movements, and loaded with such a variety of burdens, apparently so irregular, advances in a steady and unalterable course through the immensity of the Heavens.

Beauties of a different order decorate it's Architecture, and render it habitable to sensible beings. A girdle of palm-trees, to which are suspended the date and the cocoa, surrounds it between the burning Tropics ; and forests of mossy firs begird it under the Polar Circles. Other vegetables extend, like rays, from South to North, and having reached a certain latitude ex-

pire. The banana advances from the Line to the southern shore of the Mediterranean. The orange crosses that Sea, and embellishes with it's golden fruit the southern extremities of Europe. The most necessary plants, such as corn and the gramineous tribes, penetrate the farthest, and, strong from their weakness, stretch in the shelter of the vallies from the banks of the Ganges to the shores of the Frozen Ocean.

Others more hardy take their departure from the rude climates of the North, advance over the summit of Mount Taurus, and make their way, under favour of the snows, into the very bosom of the Torrid Zone. The fir and the cedar clothe the mountains of Arabia, and of the kingdom of Cachemire, and view at their feet the scorched plains of Aden and Lahor, where the date and the sugar-cane are reaped. Other trees, equally averse to heat and cold, have their centre in the Temperate Zones. The vine languishes in Germany and Senegal. The apple, the tree of my own country, never saw the Sun perpendicularly over it's head; or describing round it the complete circle of the Horizon, to ripen it's beautiful fruit.

But every soil has it's Flora and it's Pomona. The rocks, the morasses, the mire, the sand, have each of them vegetables peculiar to itself. The very shallows of the sea are fertile. The cocoa-tree thrives only on the strand, and suspends it's milky fruit over the billows of the briny deep. Other plants are adapted to the winds, to the seasons, to the hours of the day, with such exact precision, that by means of them *Linnaeus* constructed botanical almanacks and time-pieces.

Who is capable of describing the infinite variety of their figure? What cradles, arches, avenues, pyramids of verdure, loaded with fruits, present the most enchanting habitations! What happy republics lodge under their tranquil shade! What delicious banquets are there prepared! Nothing of them is lost. The quadrupeds eat the tender foliage, the feathered race the seeds, and other animals the roots and the rind. The insects feed on the offal. Their infinite legions are armed with every kind of instruments for collecting it. The bees have their thighs furnished with spoons, lined with hair, for picking up the fine powder of their flowers: the fly is provided with a pump for sucking out the sap: the worm has an augre, a wimble, a file, to separate the solid parts; and the ant has pincers for carrying off the crumbs.

On considering the diversity of form, of manners, of governments, of all those animals, and the continual wars which they wage, you would suppose them a multitude of foreign and hostile nations, who are on the point of destroying each other. From their constancy in love, the perpetuity of their species, their wonderful harmony with all the parts of the vegetable kingdom, you would receive the idea of a single people, which had it's hereditary nobility, its carpenter's, it's pump-makers, and other artisans.

Other tribes hold vegetables in contempt, and are adapted to the Elements, to Day, to Night, to Tempests, and to different parts of the Globe. The eagle trusts her nest to the rock which loses itself in the clouds ; the ostrich, to the parched sands of the desert ; the rose-coloured flamingo, to the mires of the Southern Ocean. The white bird of the Tropic and the black frigate take pleasure to sweep along in company over the vast extent of the Seas, to view from the highest regions of the Atmosphere the fleets of India toiling after them in vain, and to circumscribe the Globe from East to West, disputing rapidity of flight with the Sun himself.

In the same latitudes, the turtle dove and the paroquet, less daring, travel only from isle to isle, having their young ones in their train, and picking up in the forests the grains of spicery which they brush off as they hop from branch to branch. While fowls of this description preserve an equal temperature under the same Parallels, others find it in the track of the same Meridian. Long triangles of wild-geese and of swans go and come every year from South to North, stop only at the hoary limits of Winter, hurry, without desire and astonishment, over the populous cities of Europe, and look down with disdain on their fertile plains, which present the furrows of green corn in the midst of snow : to such a degree does liberty appear preferable to abundance, even in the eyes of the animal creation !

On the other hand, legions of heavy quails cross the Sea, and go to the South in quest of the Summer's heat. Toward the end of September they avail themselves of a northerly wind to take their departure from Europe, and flapping one wing, while they present the other to the gale, half sail, half oar, they graze the billows of the Mediterranean with their fattened rump, and

bury themselves in the sands of Africa, that they may serve as food to the famished inhabitants of Zara.

There are animals which travel only by night. Millions of crabs in the Antilles, descend from the mountains by the light of the moon, clashing their claws : and present to the Caraibs on the steril strand of their isles, innumerable shells replenished with exquisite marrow. At other seasons, on the contrary, the tortoise quits the Sea and lands on the same shores, to accumulate layers of eggs in their barren sands.

The very ices of the Pole are inhabited. We find in their Seas, and under their floating promontories of crystal, the black enormous whale, with more oil on his back than a whole plantation of olives could produce. Foxes clothed in precious furs, find the means of living on shores abandoned by the Sun ; herds of rein-deer there scratch up the snow in search of moss, and advance, braying, into those desolate regions of night, by the glimmering light of the *Aurora Borealis*. Through a Providence, worthy of the highest admiration, places the most prolific, present to Man in the greatest abundance provisions, clothing, lamps, and firing, not of his own production.

How delightful would it be to behold the Human race collecting all these various blessings, and communicating them to each other in peace from Climate to Climate ! We look with expectation, every Winter, to the period when the swallow and the nightingale shall announce to us the return of serenity. How much more affecting would it be to behold the People of distant Lands arrive with the Spring on our shores, not with the dreadful noise of artillery, like modern Europeans, but with the sound of the flute and of the hautboy, as the ancient Navigators in the earlier ages of the World ! We should behold the tawny Indian of Southern Asia forcing his way as formerly up it's mighty rivers in his leathern canoe ; penetrating through the current of the Petzora to the extremities of the North, and displaying on the frozen shores of the Icy Sea the riches of the Ganges. We should see the copper-coloured Indian of America in his hollowed log traversing the extended chain of the Antilles, conveying from isle to isle, from shore to shore, perhaps to our very Continent, his gold and emeralds. Numerous caravans of Arabs, mounted on camels and oxen, would arrive, following the course

of the Sun, from pasture to pasture, recalling the memory of the innocent and happy life of the ancient Patriarchs.

Winter itself would be no interruption to the communication of mankind. The Laplander, covered with warm fur, would arrive under favour of the snow in his sledge drawn by the reindeer, and expose for sale in our markets the sable skins of Siberia. Did men live in peace, every Sea would be navigated, every region would be explored, all their productions would be collected. What a gratification of curiosity would it be to listen to the adventures of these foreign travellers, attracted to us by the gentleness of our manners! They would not be slow in communicating to our hospitality the secrets of their plants, of their industry, and of their traditions, which they will for ever conceal from our ambitious commerce.

It is among the members of the vast family of Mankind that the fragments of their History are scattered. How interesting would it be to learn that of our ancient separation, the motives which determined each tribe to choose a separate habitation, on an unknown Globe; and to traverse, as Chance directed, mountains which presented no path, and rivers which had not yet received a name!

What pictures would be presented to us in the descriptions of those countries, decorated with a pompous magnificence, as they proceeded from the hands of Nature, but wild and unadapted to the necessities of Man destitute of experience! They would paint to us the astonishment of their forefathers at sight of the new plants which every new Climate exhibited to their view, and the trials which they made of them, as the means of subsistence; how they were aided no doubt in their necessitous circumstances, and in their industry, by some celestial Intelligence who commiserated their distress; how they gradually formed an establishment; what was the origin of their laws, of their customs, and of their religions.

What acts of virtue, what instances of generous love have ennobled the deserts, and are unknown to our pride! We flatter ourselves, that we have got a clear insight into the History of foreign Nations, because we have collected a few anecdotes, picked up at random by travellers. But this is much the same, as if they were to compose ours from the tales of a mariner, or the artificial representations of a courtier, amidst the jealousies of

war, or the corruptions of commerce. The knowledge and the sentiments of a Nation, are not deposited in books. They repose in the heads, and in the hearts, of its sages ; if there be on Earth such a thing as a secure asylum for Truth. We have already employed ourselves sufficiently in passing judgment on them ; it would be of more importance for us to submit to be judged by them in our turn, and to profit by their expressions of astonishment, at the sight of our Customs, of our Sciences, and of our Arts.

If it be delightful to acquire knowledge, it is much more delightful to diffuse it. The noblest reward of Science is the pleasure of the ignorant man instructed. What a sublime satisfaction should it be to us, to enjoy their joy, to behold their dances in our public squares, and to hear the drums of the Tartar and the ivory cornet of the negro re-echo round the statues of our Kings! Ah, if we were good, I figure them to myself struck with astonishment and sorrow, at the excessive and unhappy populousness of our cities, inviting us to spread ourselves over their solitudes, to contract marriages with them, and by new alliances to re-unite the branches of the Human Race, which are unhappily separating farther and farther, and which national prejudices disunite still more than Ages and Climates!

Alas! blessings have been given us in common, and we communicate to each other only the ills of life. Man is every where complaining of the want of land, and the Globe is covered with deserts. Man alone is exposed to famine, while the animal creation, down to insects, are wallowing in plenty. Almost every where he is the slave of his equal, while the feeblest of animals maintain their liberty against the strongest. Nature, who designed him for love, denied him arms, and he has forged them for himself, to combat his fellow. She presents to all her children asylums and festivals; and the avenues of our cities announce the approach to them only by the sad spectacle of wheels and gibbets. The History of Nature exhibits blessings only, that of Man nothing but robbery and madness. His heroes are the persons who have rendered themselves the most tremendous. Every where he despises the hand which spins the garment that clothes him, and which cultivates for him the fertile bosom of the Earth. Every where he esteems his de-

ceiver, and reveres his oppressor. Always dissatisfied with the present, he alone of beings regrets the past, and trembles at the thought of futurity. Nature has granted to him alone the knowledge of a DEITY, and swarms of inhuman religions have sprung up out of a sentiment so simple and so consolatory. What then is the power which has opposed barriers to that of Nature? What illusion has misled that marvellous reason, which has invented so many arts, except the art of being happy? O ye Legislators! boast no longer of your laws. Either Man is born to be miserable; or the Earth every where watered with his blood, and with his tears, accuses you all of having misunderstood those of Nature.

He who adapts not himself to his Country, his Country to Mankind, and Mankind to GOD, is no more acquainted with the laws of Politics, than he who, forming a system of Physics for himself alone, and separating his personal relations from all connection with the Elements, the Earth, and the Sun, is acquainted with the Laws of Nature. To the investigation of these divine harmonies I have devoted my life and this Work. If, like so many others, I have gone astray, at least my errors shall not be fatal to my religion. It alone appears to me the natural bond of Mankind, the hope of our sublime passions, and the complement of our miserable destiny. Happy if I have been able sometimes to prop with my feeble support that sacred edifice, assailed as it is in these times on every side! But its foundations rest not on the Earth, and to Heaven its stately columns rear their heads. However bold some of my speculations may be, they have nothing to do with bad people. But perhaps more than one Epicurean may discern in them that Man's supreme pleasure is in Virtue. Good citizens will perhaps find in them new means of being useful. At least I shall have the full recompense of my labour, if so much as one unfortunate wretch, ready to sink at the melancholy spectacle which the World presents, shall revive, on beholding in Nature, a Father, a Friend, a Rewarder.

Such was the vast plan I proposed to execute. I had collected in this view more materials than I had occasion for. But a variety of obstacles has prevented my making a complete arrangement of them. I shall perhaps resume this employment in happier times. I have meanwhile selected as much as was

sufficient to convey an idea of the harmonies of Nature. Though my labours are here reduced to simple *Studies* merely, I have however been careful to preserve so much order as was necessary to unveil my original design. Thus, a peristyle, an arcade half in ruins, avenues of columns, simple fragments of walls, present still to travellers, in an island of Greece, the image of an ancient temple, notwithstanding the ravages of time, and of the barbarians who demolished it.

In setting out, I change scarcely any thing of the *First Part* of my Work, the arrangement excepted. I there display, in the first place, the benefits conferred by Nature on our World, and on the age in which we live; and the objections which have been raised to the providence of their AUTHOR. I next reply successively to those which are started from the disorder of the Elements, of Vegetables, of Animals, of Man; and to those which are levelled against the nature of GOD himself. I am bold to affirm, that I have treated these subjects without any personal or extraneous consideration whatever. Having replied to those objections, I propose some in my turn to the elements of human Science, which we deem infallible; and I combat that pretended principle of our knowledge, which we call *Reason*.

After having cleared the ground of our opinions in my first Studies, I proceed in those that follow to rear the fabric of human Knowledge. I examine what may be the portion of our intelligence, at which the light of Nature fixes its boundary; and what we understand by the terms Beauty, Order, Virtue, and their contraries. I deduce the evidence of it from several laws physical and moral, the sentiment of which is universal among all Nations of the Globe. I afterwards make application of the physical laws, not to the order of the Earth, but to that of Plants.

I balanced long, I acknowledge, between these two orders. The first would have exhibited, I confidently affirm, relations entirely new, useful to Navigation, to Commerce, and to Geography. But the second has presented me with relations equally new, equally agreeable, more easily demonstrable to the generality of Readers, of high importance to Agriculture, and consequently to the most numerous description of Mankind. Besides, some of the harmonic relations of this Globe are to be found displayed in my replies to the objections against Provi-

dence, and in the elementary relations of Plants, in a manner sufficiently luminous to demonstrate the existence of this new order. The vegetable order has moreover furnished me with occasion to speak of the relations of the Globe, which extend directly to animals and to men; and likewise to suggest some hints respecting the earliest voyages of the Human Race to the principal Quarters of the World.

I apply, in the following *Study*, the laws of Nature to Man. I establish the proofs of the immortality of the soul, and of the existence of the DEITY, not on the principles of our reason, which so frequently misleads us, but on an intimate feeling, which never deceives nor betrays. I refer to those physical and moral laws, the origin of our predominant passions, Love and Ambition, and even the causes which interrupt the enjoyment of them, and which render our joys so transient, and our melancholy so profound. I flatter myself with the belief that these proofs will interest the Reader, both by their novelty and by their simplicity.

I proceed afterwards, from these notions, to propose the palliatives and the remedies adapted to the ills of Civil Society, the representation of which is delineated in the Second Volume. It was not my wish to imitate the example of most Moralists, who satisfy themselves with lashing Vice, or with turning it into ridicule, without either assigning the principal causes, or indicating the remedies: much less shall I act the part of our modern Politicians, who foment Vice, in order to make a gain of it. I am vain enough to hope that this last *Study*, which has been a most agreeable one to myself, will exhibit some views which may be rendered highly beneficial to my Country.

The rich and the great imagine that every one is miserable, and out of the World, who does not live as they do; but they are the persons who, living far from Nature, live out of the World. They would find thee, O eternal Beauty! always ancient, and always new;* O life, pure and blissful, of all those who truly live, if they sought thee only within themselves! Wert thou a steril mass of gold, or a victorious Prince, who shall not be alive to-morrow, or some attractive and deceitful female, they would perceive thee, and ascribe to thee the power

* St. Augustine's *City of God*.

of conferring some pleasure upon them. Thy vain nature would employ their vanity. Thou wouldst be an object proportioned to their timid and grovelling thoughts. But because thou art so much within themselves, where they never choose to look, and too magnificent externally, diffusing thyself through infinite space, thou remainest to them an unknown GOD.* In losing themselves, they have lost thee.

The order, nay, the beauty with which thou hast invested all thy creatures, to serve as so many steps by which Man may raise himself to thee, are transformed into a veil, which conceals thee from his sickly eyes. Men have no sight but for vain shadows. The light dazzles them. Mere nothings are to them every thing; and all-perfection passes with them for nothing. Nevertheless, he who never saw thee has never seen any thing; he who has no relish for thee is an utter stranger to true pleasure; he is as if he were not, and his whole life is only a miserable dream.

I myself, O my God, misled by the prejudices of a faulty education, pursued a vain felicity in systems of Science, in arms, in the favour of the Great, sometimes in frivolous and dangerous pleasures. In all these agitations I was hunting after calamity, while happiness was within my reach. At a distance from native Land, I sighed for joys which it contained not for me; and nevertheless thou wert bestowing on me blessings innumerable, scattered by thy bountiful hand over the whole Earth, which is the Country of Mankind. I disquieted myself to think that I had no powerful protector, that I belonged to no corps; and by Thee I have been protected amidst a thousand dangers, in which they could have afforded me no assistance. It grieved me to think of living solitary, unnoticed, unregarded; and Thou hast vouchsafed to teach me, that Solitude is far preferable to the bustle of a Court, and Liberty to Grandeur. It filled me with many a painful reflection, that I had not the felicity to be directed to some fair spouse, to be the companion of my life, and the object of my affection; and thy wisdom invited me to walk to her habitation, and discovered to me in each of her productions an immortal Venus.

* Fenelon, on the existence of God.

I never ceased to be happy, but when I ceased to trust in Thee. O my God! give to these labours of a man, I do not say the duration or the spirit of life, but the freshness of the least of thy Works! Let their divine graces be transfused into my writings, and bring back a corrupted Age to Thee, as by them I myself have been brought back! Opposed to Thee, all power is weakness; supported by Thee, weakness becomes irresistible strength. When the rude northern blasts have ravaged the Earth, thou callest for the feeblest of winds; at the sound of thy voice the zephyr breathes, the verdure revives, the gentle primrose and the humble violet cover the bosom of the bleak rock with a mantle of gold and purple.

STUDY II.

BENEFICENCE OF NATURE.

MOST men, in policed Nations, look on Nature with indifference. They are in the midst of her Works, and they admire only human grandeur. What charm after all can render the History of Man so interesting? It has to boast of vain objects of glory alone, of uncertain opinions, of bloody victories, or at most of useless labours. If Nature sometimes finds a place in it, we are called upon to observe only the ravages which she has committed, and to hear her charged with a thousand calamities, which may be all traced up to our own imprudence.

With what unremitting attention, on the contrary, is this common mother providing for us the means of happiness! She has diffused her benefits over the Globe from Pole to Pole, entirely in the view of engaging us to unite in a mutual communication of them. She is incessantly recalling us from the prejudices which unhappily separate Mankind, to the universal laws of Justice and Humanity, by frequently putting our ills in the hands of the so highly vaunted conquerors, and our pleasures in those of the oppressed, whom we hardly deign to favour with so much as our pity.

When the Princes of Europe issued forth with the Gospels in their hand to ravage Asia, they brought back with them the pestilence, the leprosy, and the small-pox; but Nature pointed out to a Dervise the coffee plant, in the mountains of Yemen, and produced at one and the same time our plagues from our Croisades, and our delicious beverage from the cup of a Mahometan monk. The successors of these Princes subjugated the American Continent, and have transmitted to us, by means of this discovery and conquest, an inexhaustible succession of wars and venereal diseases. While they were exterminating the inoffensive inhabitants of it by their murderous artillery, a Caraib, in token of peace, set the sailors a smoking his calumet; the perfume of tobacco dissipated their chagrin, and the use of it is disseminated over the whole Earth; and while the miseries of the two Worlds are issuing from the cannon's mouth,

which Kings call their *ULTIMA RATIO*, the consolations of the civilized States of Europe stream from the pipe of a Savage.

To whom are we indebted for the use of sugar, of chocolate, of so many agreeable means of subsistence, and of so many salutary medicines? To naked Indians, to poor Peasants, to wretched Negroes. The spade of slaves has done more good, than the sword of conquerors has done mischief. But in which of our great squares are we to look for the statutes of our obscure benefactors? Our Histories have not vouchsafed so much as to preserve their names. We need not, however, to go so far in quest of proofs of the obligations under which we lie to Nature; is it not to the study of her laws that Paris is indebted for such multiplied illumination, collected from every quarter of the Globe, combined a thousand different ways, and reflected over Europe in Sciences the most ingenious, and enjoyments the most refined, of every species?

Where is now the time when our forefathers leaped for joy at finding a wild plum-tree on the banks of the Loire; or at catching a poor roe in the chace in the vast plains of Normandy? Our fields, now so richly clothed with harvests, and orchards, and flocks, did not then produce the common necessities of life. They wandered up and down, living on the precarious supplies of hunting, and not daring to trust to Nature. Her simplest phenomena filled them with terror. They trembled at the sight of an eclipse, of an *ignis-fatuus*, of a branch of mistletoe on the oak. Not that they believed the affairs of the World to be surrendered to Chance. They recognized every where Gods possessed of intelligence; but not daring to believe them good, while cruel priests were their only instructors in religion, these unfortunate people imagined that the Gods took pleasure only in tears, and immolated to them human victims, on the very spot perhaps on which now stands a receptacle for the wretched.*

* Some Writers of our own have composed the eulogium of the Druids. I shall oppose to them, among other authorities, that of the Romans, who it is well known were abundantly tolerant in matters of religion. Cæsar, in his Commentaries, informs us that the Druids, in honour of their Gods, burnt men in baskets of osier; and that when criminals were wanting for this horrible purpose, they sacrificed even the innocent. Suetonius, in his life of Claudius, gives this account of the matter: "The religion of the Druids, too cruel it must be confessed, and which from the time of Augustus had been

Let me suppose that a Philosopher, such as *Newton*, were then to have treated them with the spectacle of some of our natural Sciences, and to have shewn them with the microscope forests in moss, mountains in grains of sand, thousands of animals in drops of water, and all the wonders of Nature, which in a downward progress to nothing multiplies the resources of her intelligence, while the human eye becomes incapable of perceiving the boundary: Let me go on to suppose that afterwards discovering to them in the Heavens a progression of greatness equally infinite, he had shewn them in the planets, hardly perceptible to the naked eye, Worlds much greater than ours, Saturn, three hundred millions of leagues distant; in the fixed stars, infinitely more remote, Suns which probably illuminate other Worlds; in the whiteness of the Milky Way, stars, that is Suns, innumerable, scattered about in the Heavens as grains of dust on the Earth, without Man's knowing whether all this may not be more than the threshold of Creation merely; with what transports would they have viewed a spectacle which we at this day behold without emotion?

But I would rather suppose that, unprovided with the magic of Science, a man like *Fenelon* had presented himself to them in all the majesty of Virtue, and thus addressed the Druids: "You frighten yourselves, my friends, with the groundless terrors which you instil into the people. God is righteous. He conveys to the wicked terrible apprehensions, which recoil on those who communicate them. But he speaks to all men in

"simply forbidden, was by him entirely abolished." Herodotus had long before loaded them with the same reproach.

All that can be opposed to the testimony of three Roman Emperors, and to that of the Father of History, is the silly evidence of the Romance of *Astræa*. Have we not faults enough justly chargeable on ourselves, without undertaking the difficult task of justifying those of our ancestors? They were not indeed, it must be allowed, more culpable than other Nations, who all presented human sacrifices to the DIVINITY. Plutarch reproaches the Romans themselves with having immolated, in the earlier times of the Republic, two Gauls and two Greeks whom they buried alive.

Is it possible then that the first sentiment of Man in a state of nature could have been that of terror; and that he must have believed in the Devil before he believed in God? O! no. It is Man who universally has misled Man. One of the great benefits for which we are indebted to the Christian Religion, has been the destruction, in a considerable part of the World, of these inhuman doctrines and sacrifices.

“ the blessings which he bestows. Your religion would govern
 “ men by fear ; mine draws them with cords of love, and imitates
 “ his Sun in the firmament, whom He causes to shine on the
 “ evil and on the good.” Let me finally suppose, that after this
 he had distributed among them the simple presents of Nature,
 till then unknown, sheaves of corn, slips of the vine, sheep
 clothed with the woolly fleece. Oh ! what would have been the
 gratitude of our grandfathers ! They would perhaps have fled
 with terror from the Inventor of the telescope, mistaking him
 for a Spirit ; but undoubtedly they would have fallen down and
 worshipped the Author of Telemachus.

These, after all, are only the smallest part of the blessings
 for which their opulent descendants stand indebted to Nature.
 I say nothing of that infinite number of arts which are employ-
 ed at home to diffuse knowledge and delight ; nor of that ter-
 rible invention of artillery which secures to them the enjoyment
 of these, while the noise of it disturbs their repose at Paris only
 to announce victories ; nor of that new and still more wonderful
 art of electricity, which screens* their hotels from the thunder ;

* On the subject of the effects of Electricity, a thought abundantly impi-
 ous has been expressed in a Latin verse, the import of which is, that Man
 has *disarmed the DEITY*. Thunder is by no means a particular instrument
 of Divine Justice. It is necessary to the purification of the air in the heats
 of Summer. God has permitted to Man the occasional disposal of it, as He
 has given him the power of using Fire, of crossing the Ocean, and of con-
 verting every thing in Nature to his advantage. It is the ancient Mythology,
 which, representing Jupiter always wielding the thunder, has inspired us
 with so much terror. We find in the Holy Scriptures ideas of the DIVINITY
 much more consolatory, and a much sounder Philosophy. I may perhaps
 be mistaken, but I do not believe there is a single passage in the Bible in
 which thunder is mentioned as an instrument of divine Justice. Sodom was
 destroyed by showers of fire and brimstone. The ten plagues with which
 Egypt was smitten, were the corruption of the waters, swarms of reptiles,
 lice, flies, the pestilence, ulcers, hail, caterpillars, thick darkness, and the
 death of the first-born. Corah, Dathan, and Abiram, were consumed by fire
 issuing out of the Earth. When the Israelites murmured in the wilderness
 of Parua, *the fire of the LORD burnt among them, and consumed them that were*
in the uttermost parts of the camp, Numb. xi. 1. In the threatenings denoun-
 ced against the people in Leviticus, no mention is made of thunder. On the
 contrary, it was amidst the noise of thunder that GOD promulgated his law
 to his chosen people from Mount Sinai. Finally, in that sublime piece of poe-
 try, wherein David summoned all the works of JEHOVAH, to praise him, he
 calls among the rest, upon the thunder ; and it is not foreign to our purpose

nor of the privilege which they have in this venal age of presiding in all States over the happiness of men, when they believe they have nothing more to fear from the powers of Earth and Heaven.

But the whole world is engaged in the pursuit of pleasure only. England, Spain, Italy, the Archipelago, Hungary, all Southern Europe, is adding every year wools to their wools, wines to their wines, silks to their silks. Asia sends them diamonds, spices, muslins, chintzes, and porcelain; America, the gold and silver of her mountains, the emeralds of her rivers, the dye-stuffs of her forests, the cochineal, the sugar-cane, and the cocoa-nut of her fervid plains, which their hands did not cultivate; Africa, her ivory, her gold, her very children, which serve them as beasts of burden all over the Globe.

There is not a spot of the Earth, or of the Sea, but what furnishes them with some article of enjoyment. The gulfs of the Ocean provide them pearls, its shallows ambergris, and its icy promontories furs. At home they have reduced the rivers and mountains to a state of vassalage, in order to reserve to themselves feudal rights to fisheries and chaces. But there was no occasion to put themselves to so much expense. The sands of Africa, where they have no game-keeper, send them in clouds quails and other birds of passage, which cross the Sea in Spring, to load their table in Autumn. The Northern Pole, where they have no cruiser, pours on their shores every Summer legions of mackarel, of fresh cod, and of turbot, fattened in the long nights of Winter.

Not only the fowls and the fishes change for them their climate but the very trees themselves. Their orchards formerly were transplanted from Asia, and now their parks from America. Instead of the chesnut and walnut, which surrounded the farms of their vassals in the rustic domains of their ancestors, the ebony, the sorb-apple of Canada, the great chesnut of India, the magnolia, the tulip-bearing laurel, encircle their country palaces with the umbrage of the New World, and ere long of its solitudes. They have summoned the jasmin from Arabia, the orange from China, the pine-apple from Brasil, and a multi-

to remark, that he includes in his summons all the meteors which enter into the necessary harmony of the Universe. He qualifies them with the majestic title of the *Angels*, and *Hosts* of the MOST HIGH. See *Psalms* cxlviii.

tude of sweet-scented plants from every region of the torrid Zone. They have no longer occasion for suns: they can dispose of latitudes. They can convey in their hot-houses the heats of Syria to exotic plants, at the very season when their hinds are perishing with the cold of the Alps in their hovels.

No one of the productions of Nature can escape their avidity. What they cannot have while living, they contrive to have when dead. The insects, birds, shell-fish, minerals, nay the very soil of the most distant lands enrich their cabinets. Painting and engraving present them with the prospect, and procure them the enjoyment of the Glaciers of Switzerland, during the burning heat of the Dog-days; and of the Spring of the Canaries, in the midst of Winter. The intrepid Navigator brings them from regions into which the Arts dare not to penetrate, journals of voyages still more interesting than the productions of the pencil; and redouble the silence, the tranquillity, the security of their nights, sometimes by a recital of the horrible tempests of Cape-Horn, sometimes by that of the dances of the happy Islanders of the South-Seas.

Not only every thing that actually exists, but Ages past, all contribute to their felicity. Not for the Temple of Venus only did Corinth invent those beautiful columns rising like palm-trees; no, but to support the alcove of their beds. Their voluptuous Art veils the light of the day through taffetas of every colour; and imitating by softened reflexes, either of moon-light or of sun-rising, represents the objects of their loves like so many Dianas or Auroras. The art of Phidias has for them produced a contrast to female beauty, in the venerable busts of a Socrates and a Plato.

Obscure scholars, by efforts of labour which nothing can remunerate, have for them procured the knowledge of the sublime geniuses who were ornaments of the World in times nearer to the Creation; Orpheus, Zoroaster, Esop, Lokman, David, Solomon, Confucius, and a multitude of others, unknown even to Antiquity. It was not for the Greeks, it is for them, that Homer still sings of Heroes and of Gods, and that Virgil warbles the notes of the Latin flute, which ravished the ears of the Court of Augustus, and there rekindled the love of Country and of Nature. For them it is that Horace, Pope, Addison, La Fontaine, Gesner, have smoothed the rough paths of Wisdom.

and have rendered them more accessible, and more lovely, than the treacherous steeps of Folly.

A multitude of Poets and Historians of all Nations, a Sophocles, an Euripides, a Corneille, a Racine, a Shakespear, a Tasso, a Xenophon, a Tacitus, a Plutarch, a Suetonius, introduce them into the very closets of those terrible Potentates, who bruised with a rod of iron the head of the Nations whose happiness was intrusted to their care, and call them to rejoice in their happy destiny, and to hope for a better still, under the reign of another Antoninus. Those vast geniuses, of all Ages and of all Countries, celebrating without concert the undecaying lustre of Virtue and the Providence of Heaven in the punishment of Vice, add the authority of their sublime reason to the universal instinct of Mankind, and multiply a thousand and a thousand times in their favour the hopes of another life, of much longer duration, and of more exalted felicity.

Does it not seem reasonable that a chorus of praise should ascend day and night from the dome of every hotel to the AUTHOR of Nature? Never did ancient King of Asia accumulate so many means of enjoyment in Susa or in Echatana, as our common tradesmen do in Paris. These Monarchs, nevertheless, every day paid adoration to the Gods; they would engage in no enterprize till the Gods were consulted; they would not so much as sit down to table until the libation of religious acknowledgment was poured out. Would to GOD that our Epicureans were chargeable with indifference only to the hand which is continually loading them with benefits! But it is from the very lap of plenteousness and pleasure that the voice of murmuring against Providence now arises. From their Libraries, stored with so many sources of knowledge, issue forth the black clouds which have obscured the hopes and the virtues of Europe.

STUDY III.

OBJECTIONS AGAINST PROVIDENCE.

“ THERE is no God,” say these self-constituted sages. From the work form your judgment of the workman.* Observe first of all this Globe of ours, so destitute of proportion and symmetry. Here it is deluged by vast seas ; there it is parched with thirst, and presents only wildernesses of barren sand. A centrifugal force, occasioned by it’s diurnal rotation, has heaved out it’s Equator into enormous mountains, while it flattened the Poles : for the Globe was originally in a state of softness ; whether it was a mud recovered from the empire of the waters, or what is more probable, a scum detached from the Sun. The volcanos which are scattered over the whole Earth, demonstrate, that the fire which formed it is still under our feet. Over this scoria, so wretchedly levelled, the rivers run as chance directs. Some of them inundate the plains ; others are swallowed up, or precipitate themselves in cataracts, and no one of them presents any thing like a regular current. The Islands are merely fragments of the Continent, violently separated from it by the Ocean ; and what is the Continent itself, but a mass of hardened clay ? Here the unbridled Deep devours it’s shores ; there it deserts them, and exhibits new mountains which had been formed in it’s womb. Amidst this conflict of contending elements, this baked lump grows harder and harder, colder and colder, every day. The ice of the Poles and of the lofty mountains advance into the plains, and insensibly extend the uniformity of an eternal Winter over this mass of confusion, ravaged by the Winds, the Fire, and the Water.

“ In the vegetable World the disorder increases upon us.† Plants are a fortuitous production, of humid and dry, of hot and cold, the mould of the Earth merely. The heat of the Sun makes them spring up, the cold of the Poles kills

* See replies to this objection in Study IV.

† The reply is in Study V.

“ them. Their sap obeys the same mechanical laws with the
 “ liquid in the thermometer, and in capillary tubes. Dilated
 “ by heat, it ascends through the wood, and re-descends through
 “ the rind, following in it’s direction the vertical column of the
 “ air which impresses that direction. Hence it is that all vege-
 “ tables rise perpendicularly, and that the inclined plain of a
 “ mountain can contain no more than the horizontal plane of it’s
 “ base, as may be demonstrated by Geometry. Besides, the
 “ Earth is an ill-assorted garden, which presents almost every
 “ where useless weeds, or mortal poisons.

“ As to the animals which we know better, because they are
 “ brought nearer to us by similar affections and similar wants,
 “ they present still greater absurdities.* They proceeded at
 “ first from the expansive force of the Earth in the first Ages
 “ of the World, and were formed out of the fermented mire
 “ of the Ocean and of the Nile, as certain Historians assure
 “ us ; among others Herodotus, who had his information from
 “ the Priests of Egypt. Most of them are out of all propor-
 “ tion, Some have enormous heads and bills, such as the
 “ toucan ; others long necks and long legs, like the crane :
 “ these have no feet at all, those have them by hundreds ;
 “ others have theirs disfigured by superfluous excrescences,
 “ such as the meaningless spurs of the hog, which appended
 “ at the distance of some inches from his feet, can be no ser-
 “ vice to him in walking.

“ There are animals scarcely capable of motion, and which
 “ come into the World in a paralytic state, such as the sloth or
 “ sluggard, who cannot make out fifty paces a day, and screams
 “ out lamentably as he goes.

“ Our cabinets of Natural History are filled with monsters ;
 “ bodies with two heads ; heads with three eyes, sheep with
 “ six feet, &c. which demonstrate that Nature acts at random,
 “ and proposes to herself no determinate end, unless it be
 “ that of combining all possible forms : and after all this plan
 “ would denote an intention which it’s monotony disavows.
 “ Our Painters will always imagine many more beings than
 “ can possibly be created. Add to all this, the rage and fury
 “ which desolate every thing that breathes ; the hawk devours
 “ the harmless dove in the face of Heaven.

* The reply to this is in Study VI.

" But the discord which rages among animals is nothing,
 " compared to that which consumes the human race.* First,
 " several different species of men, scattered over the Earth,
 " demonstrate that they do not all proceed from the same
 " original. There are some black, others white, red, copper-
 " coloured, lead-coloured. There are some who have wool
 " instead of hair ; others who have no beard. There are dwarfs
 " and giants .Such are in part the varieties of the human spe-
 " cies, every where equally odious to Nature. No where
 " does she nourish him, with perfect good-will. He is the
 " only sensible being laid under the necessity of cultivating
 " the earth in order to subsist ; and as if this unnatural mo-
 " ther were determined to persecute with unrelenting severity,
 " the child whom she has brought forth, insects devour the
 " seed as he sows it, hurricanes sweep away his harvests, fe-
 " rocious animals prey on his cattle, volcanos and earthquakes
 " destroy his cities ; and the pestilence which from time to
 " time makes the circuit of the Globe, threatens at length his
 " utter extermination.

" He is indebted to his own hands for his intelligence, his
 " morality is the creature of climate, his governments are
 " founded in force, and his religion in fear. Cold gives him
 " energy ; heat relaxes him. Warlike and free in the North,
 " he is a coward and a slave between the Tropics. His only
 " natural laws are his passions. And what other laws should
 " we look for ? If they sometimes lead him astray, is not
 " Nature, who bestowed them upon him, an accomplice at least
 " in his criminality ? But he is made sensible of their im-
 " pulse, only as a warning never to gratify them.

" The difficulty of finding subsistence, wars, impost, pre-
 " judices, calumnies, implacable enemies, perfidious friends,
 " treacherous females, four hundred sorts of bodily distemper,
 " those of the mind, both more cruel and more numerous, ren-
 " der him the most wretched of creatures that ever saw the
 " light. It were much better that he had never been born.
 " He is every where the victim of some tyrant. Other ani-
 " mals are furnished with the means of fighting, or at least of
 " flying ; but Man has been tossed on the Earth by chance,

* The reply is in Study VII.

“ without an asylum, without claws, without fangs, without
 “ velocity, without instinct, and almost without a skin ; and as
 “ if it were not enough to be persecuted by all nature, he is in
 “ a state of perpetual war with his own species. In vain
 “ would he try to defend himself from it. Virtue steps in and
 “ binds his hands, that Vice in safety may cut his throat. He
 “ has no choice but to suffer, and to be silent.

“ What after all is this virtue, about which such parade is
 “ made? A combination of his imbecility ; a result of his
 “ temperament. With what illusions is he fed? Absurd opi-
 “ nions, founded merely on the sophisms of designing men,
 “ who have acquired a supreme power by recommending hu-
 “ mility, and immense riches by preaching up poverty. Eve-
 “ ry thing expires with us. From experience of the past, let
 “ us form a judgment of the future ; we were nothing before
 “ our birth ; we shall be nothing after death. The hope of
 “ our virtues is a mere human invention, and the instinct of
 “ our passions is of divine institution.

“ But there is no GOD.* If there were, He would be un-
 “ just. What being of unlimited power and goodness would
 “ have exposed to so many ills the existence of his creatures ;
 “ and laid it down as a law, that the life of some could be sup-
 “ ported only by the death of others? So much disorder is a
 “ proof that there is no GOD. It is fear that formed him.
 “ How must the World have been astonished at such a meta-
 “ physical idea, when Man first, under the influence of terror,
 “ thought proper to cry out that there was a GOD ! What
 “ could have made him GOD? Why should he be GOD?
 “ What pleasure could he take in that perpetual circle of woes,
 “ of regenerations, and of deaths?”†

* The reply is in Study VIII.

† The refutation of these objections will be found by the numeral characters, which correspond to each particular Study. All of them are there resolved directly or indirectly : for it was not possible to follow in a Work of this kind, the scholastic order of a system of philosophy.

STUDY IV.

REPLIES TO THE OBJECTIONS AGAINST PROVIDENCE.

SUCH are the principal objections which have been raised in almost every Age against a Providence, and which no one will accuse me of having stated too feebly. Before I attempt a refutation of them, I must be permitted to make a few reflections on the persons who maintain them.

Did these murmurings proceed from some wretched mariners, exposed at sea to all the revolutions of the Atmosphere, or from some oppressed peasant, labouring under the contempt of that society whom his labour is feeding, my astonishment would be less. But our Atheists are for the most part well sheltered from the injuries of the Elements, and especially those of Fortune. The greatest part of them have never so much as travelled. As to the ills of Civil Society, they most unreasonably complain; for they enjoy it's sweetest and most respectful homage, after having burst asunder all its bands, by the propagation of their opinions. What have they not written on Friendship, on Love, on Patriotism, and on all the Human affections, which they have reduced to the level of those of beasts, while some of them could render human affection almost divine by the sublimity of their talents!

Are they not in part the very persons to whom many of our calamities may be justly imputed, for their flattering in a thousand different ways the passions of our modern tyrants, whilst a cross rising in the midst of a desert comforts the miserable? It is a matter of no small difficulty to retain these last, in a rational devotion; and it is a moral phenomenon which appeared to me for a long time inexplicable, to behold in every Age atheism springing up among men who have most reason to cry up the goodness of Nature, and superstition among those who have the justest ground of complaint against her. It is amidst the luxury of Greece and Rome, in the bosom of the wealth of Indostan, of the pomp of Persia, of the voluptuousness of China, of the overflowing abundance of European Capitals, that men first started up who dared to deny the

existence of a DEITY. On the contrary, the houseless Tartars; the Savages of America, continually pressed with famine; the Negroes, without foresight, and without a police; the inhabitants of the rude climates of the North, such as the Laplanders, the Greenlanders, the Esquimaux, see Gods every where, even in a flint, in a pebble.

I long thought that atheism, in the rich and luxurious was a dictate of conscience. "I am rich, and I am a knave," must be their reasoning, "therefore there is no GOD." "Besides, "if there is a GOD, I have an account to render." But these reasonings, though natural, are not general. There are atheists, who possess legitimate fortunes, and use them morally well, at least externally. Besides, for the contrary reason, the poor man ought always to argue thus: "I am industrious, honest, and "miserable; therefore there must be no Providence." But in Nature herself we must look for the source of this ratiocination.

In all countries the poor rise early, labour the ground, live in the open air, and in the fields. They are penetrated with that active power of Nature which fills the Universe. But their reason sinking under the pressure of calamity, and distracted by their daily occasions, is unable to support it's lustre. It stops short, without generalizing, at the sensible effects of this invisible cause. They believe, from a sentiment natural to weak minds, that the objects of their religious worship will be at their disposal, in proportion as they are within their reach. Hence it is that the devotions of the common people in every country are presented in the fields, and have natural objects for their centre. It always attracts the religion of the peasantry. A hermitage on the side of a mountain, a chapel at the source of a stream, a good image of the virgin in wood niched in the trunk of an oak, or under the foliage of a hawthorn, have to them a much more powerful attraction than the gilded altars of our Cathedrals. I except those, however, whom the love of money has completely debauched, for such persons must have saints of silver, even in the country.

The principal religious acts of the people in Turkey, in Persia, in the Indies, and in China, are pilgrimages in the fields. The rich, on the contrary, prevented in all their wants and wishes by men, no longer look up to GOD for any thing. Their whole life is passed within doors, where they see only the productions of

human industry, lustres, wax-candles, mirrors, secretaries, parasites, books, wits. They come insensibly to lose sight of Nature ; whose productions are besides almost always exhibited to them disfigured or out of season, and always as an effect of the art of their gardeners or artisans.

They fail not likewise to interpret her sublime operations, by the mechanism of the arts most familiar to them. Hence so many systems, which easily enable you to guess at the occupation of their authors. Epicurus, exhausted by voluptuousness, framed his world and his atoms, with which Providence has nothing to do, out of his own apathy ; the Geometrician forms it with his compasses ; the Chymist compounds it of salts ; the Mineralist extracts it from the fire ; and they who apply themselves to nothing, and these are not few in number, suppose it like themselves in a state of chaos, and moving at random.

Thus the corruption of the heart is the original source of our errors. Afterwards, the Sciences employing, in the investigation of natural things, definitions, principles, methods, invested with a great geometrical apparatus, seem by this pretended order to reduce to order what widely deviates from it. But supposing this order to exist, such as they present it to us, of what use could it be to Man ? Would it be sufficient to restrain and console the miserable ; and what interest will they take in that of a society which tramples them under foot, when they have nothing to hope from that of Nature, who abandons them to the laws of motion ?

I now proceed to answer one after another the objections formerly stated against Providence, founded on the disorders of the globe ; of vegetables, of animals, of Man, and on the nature of God himself.

Replies to the Objections against Providence, founded on the Disorders of the Globe.

Though my ignorance of the means employed by Nature in the government of the World is greater than I am able to express ; it is sufficient, however, to throw one's eyes on a geographical chart, and to have read a little, to be enabled to demonstrate that those by which her operations are pretendedly ex-

plained to us have no foundation in truth. From human insufficiency spring the objections levelled at the divine Providence.

First, it appears to me no more natural to compose the uniform motion of the Earth through the Heavens, of the two motions of projection and attraction, than to attribute to similar causes that of a man walking on the Earth. The centrifugal and centripetal forces seem to me no more to exist in the Heavens, than the two circles denominated the Equator and the Zodiac. However ingenious these hypotheses may be, they are only scaffoldings imagined by men of genius for rearing the fabric of Science, but which no more assist us in penetrating into the Sanctuary of Nature, than those employed in the construction of our churches can introduce us into the sanctuary of Religion. These combined forces are no more the moving principle of the course of the stars, than the circles of the spheres are their barriers. They are signs merely which have at last usurped the place of the objects which they were intended only to represent, like every thing else of human establishment.

If a centrifugal force had swelled the mountains of the Globe when it was in a state of fusion, there must have been mountains much more elevated than the Andes of Peru and Chili. That of Chimboraco, which is the highest of them, is only 3220 or 3350 fathoms in height, for the Sciences are not perfectly agreed even in matters of observation. This elevation, which is nearly the greatest known on Earth, is less perceptible on it than the third part of a line would be on a globe of six feet diameter. Now, a mass of melted metal presents, in proportion to it's size, scorias much more considerable. Look at the anfractuosities of a simple morsel of iron dross. What frightful swellings then must have been formed on a globe of heterogeneous and fermenting materials, more than three thousand leagues thick? The Moon, whose diameter is much less considerable, contains, according to *Cassini*, mountains three league high. But what would be the case if, with the action of the heterogeneousness of our terrestrial materials all in fusion, we should besides suppose that of a centrifugal force produced by the Earth's rotatory motion round it's axis? I imagine that this force must have been necessarily exerted in the direction of it's Equator, and instead of forming it into a globe, must have flat-

tened it out in the Heavens, like those large plates of glass which glass-blowers expand with their breath.

Not only the diameter of the Earth at the Equator is no greater than under it's Meridians, but the mountains there are not more elevated than elsewhere. The noted Andes of Peru have not their commencement at the Equator, but several degrees beyond it toward the South; and coasting along Peru, Chili, and Magellan's land, stop at the fifty-fifth degree of Southern Latitude, in the Terra del Fuego, where they present to the Ocean a promontory of ice of a prodigious height. Through the whole extent of this immense track, they never open but at the Straits of Magellan, forming throughout, according to the testimony of *Garcillaso de la Véga*,* a rampart fortified with pyramids of ice, inaccessible to men, to quadrupeds, and even to birds.

The mountains on the isthmus of Panama, on the contrary, which are nearly under the Line, have an elevation so small in comparison with the Andes, that Admiral *Anson*, who had coasted along the whole, relates that on his arriving at these heights he experienced stifling heats, because the air, says he, was not refreshed by the Atmosphere of the lofty mountains of Chili and Peru.

The highest mountains of Asia are entirely out of the Tropics. The chain, known by the names of Taurus and Imaus, commences in Africa at Mount Atlas, toward the thirtieth degree of northern latitude. It runs across all Africa and all Asia, between the thirty-eighth and fortieth degree of north latitude, having it's summit covered for the most part through that immense extent with snows that never melt; a proof, as shall afterwards be demonstrated, of a very considerable elevation.

Mount Ararat, which makes part of this chain, is perhaps more elevated than any mountain of the New World, if we form a judgment from the time which *Tournefort* and other travelers took to perform the distance from the basis of that mountain, up to the commencement of the snow which covers it's summit, and which is less arbitrary from the distance at which it may be seen, and that is at least six days journey of a caravan.

* History of the Incas. Book I. chap. 8.

The Peak of Teneriff is visible forty leagues off. The mountains of Norway, called Felices, and by some the Alps of the North, are visible at sea fifty leagues distant; and, if we may believe an ingenious Swedish Geographer, are three thousand fathoms high.

The peaks of Spitsberghen, of New-Zealand, of the Alps, of the Pyrennées, of Switzerland, and those on which ice is found all the year round, are exceedingly elevated; though most of them very remote from the Equator. They do not even run in directions parallel to that circle, as must have been the case on the supposition of the effect produced by the rotation of the Globe; for if the chain of Taurus in the ancient Continent runs from West to East, that of the Andes in the new runs from North to South. Other chains proceed in other directions.

But if the pretended centrifugal force once had the power of heaving up mountains, why does it possess at this day the power of tossing up a straw into the air? It ought not to leave a single detached body on the surface of the Earth. They are affixed to it, I shall be told, by the centripetal force or gravity. But if this last power in fact forces every body toward it, why have not the mountains too submitted to this universal law when they were in a state of fusion? I cannot conceive what reply can be made to this twofold objection.

The Sea appears to me not more adapted to the formation of mountains than the centrifugal force is. How is it possible to imagine the possibility of it's having thrown them out of it's womb? It is incontrovertible, however, that marbles and calcareous stones, which are only pastes of madrépores and shells amalgamated; that flints, which are concretions of these; that marles, which are a dissolution of them; and that all marine bodies, which are found in every part of both Continents, have issued out of the Sea. These matters serve as a basis to great part of Europe; hills of a very considerable height are composed of them, and they are found in many parts of both the Old and New Worlds, at an equal degree of elevation. But their strata cannot be explained by any of the actual movements of the Ocean. In vain would we ascribe to it revolutions from West to East; never will it have the power of raising any thing above it's level. If certain parts of the Mediterranean are produced as instances, which the Sea has actually left dry,

it is no less certain that there is a much greater number on the same coasts which the water has not deserted. Hear what is said on the subject by that judicious Observer *Maundrel*, in his journey from Aleppo to Jerusalem, in 1669: "In the Adriatic Gulf, the light-house of Ariminum, or Rimini, is a league from the sea; but Ancona, built by the Syracusans, is still close to the shore. The arch of Trajan, which rendered it's port more commodious for merchants, is situated immediately upon it. Beritta, the favourite spot of Augustus, who gave it the name of *Julia Felix*, preserves no remains of it's ancient beauty, except it's situation on the brink of the Sea, above which it is elevated no higher than is necessary to secure it against the inundations of that element."

The testimony of travellers the most accurate is conformable to that of this ingenious English gentleman. His compatriot, *Richard Pocock*, who travelled into Egypt in 1737, with less taste, but with still greater accuracy, attests that the Mediterranean has gained fully as much ground as it has lost.* "Nothing more is necessary," says he, "to produce a conviction of this than to examine the coast; for you will see under water not only a variety of artificial productions, manufactured in the rock, but likewise the ruins of many edifices. About two miles from Alexandria are to be seen under water the ruins of an ancient temple."

An anonymous English traveller, in the journal of a voyage stored with excellent observations, describes several very ancient cities of the Archipelago, such as Samos, the ruins of which are close to the Sea. Hear what he says of Delos, which is, as every one knows, in the centre of the Cyclades.† "We found nothing else all along the coast but the remains of superb edifices which had never been completed, and the ruins of others which have been destroyed. The Sea appears to have gained on the Isle of Delos; and the water being clear, and the weather calm, we had an opportunity of observing the remains of beautiful buildings in places where now the

* Travels into Egypt. Vol. I. pages 4 and 30.

† Voyage into France, Italy, and the Islands of the Archipelago, in 1763. Vol. iv. Letter cxxvii. page 256.

“fishes swim at their ease, and on which the small boats of these cantons row to get at the coast.”

The ports of Marseilles, Carthage, Malta, Rhodes, Cadiz, and many others are still frequented by Navigators, as they were in the remotest Antiquity. The Mediterranean could not have sunk at any one point of it's shores without sinking at every other, for water in the bason always comes to it's level. This reasoning may be extended to all the coasts of the Ocean. If there are found any where tracts of land abandoned, it is not because the Sea retires, but because the Earth is gaining ground. This is the effect of alluvions, occasioned frequently by the overflowing of rivers, and sometimes by the ill-advised labours of Man. The encroachments of the Sea on the Land are equally local; and are the effect of earthquakes, which can be extended to no great distance. As these reciprocal invasions of the two Elements are particular, and frequently in opposition on the same coasts, which have in other respects constantly preserved their ancient level, it is impossible to deduce from them any general law for the movements of the Ocean.

We shall presently examine how so many marine fossils could have been extracted from it's bed; and I confidently believe, that, conformably to respectable traditions, we shall be able to advance something on this subject not unworthy of the Reader's attention. To return then to other mountains, such as those of granite, which are the highest on the Globe, and the formation of which has not been imputed to the Sea, because they contain no deposit to attest such transition, the same Naturalists employ another system to account for their origin. They suppose a primitive Earth, whose height equalled that of the present elevation of the highest peaks of the Andes, of Mount Taurus, of the Alps, and other ridges, which remain so many evidences of the existence of that primeval soil: after this they employ snows, rains, winds, and I know not what besides, to lower this original Continent down to the brink of the Sea; so that we inhabit only the bottom of this enormous quagmire. This idea has an imposing air; first, because it terrifies; and then, because it is conformable to that picture of apparent ruin which the Globe presents: but it vanishes away before this simple question, What has become of the earth and the rocks of this tremendous riddance?

If it is said, They have been thrown into the Sea. We must suppose, prior to all degradation, the existence of the bed of the Sea, and its excavation would then present a great many other difficulties. But let us admit it. How comes it that those ruins have not, in part accumulated? Why has not the Sea overflowed? How can it have happened, on the contrary, that it should have deserted such immense tracks of land as are sufficient to form the greatest part of two vast Continents? Our systems therefore cannot account for the steeply elevation of mountains of granite by any kind of degradation, because they know not how to dispose of the fragments; nor for the formation of calcareous mountains, by the movements of the Ocean, because in it's actual state it is incapable of covering them.

Besides, it is not an opinion of yesterday, that Philosophers have considered the Earth as a decaying edifice. Hear what Baron *Rusbequius* says of the opinion of *Polybius*, in his curious and entertaining letters: "*Polybius* pretends to have proved "that the entrance of the Black Sea would in process of time "be choked by the banks of sand and by the mud which the "Danube and the Boristhenes were constantly forcing into it: "and that consequently the Black Sea would be rendered inaccessible, and it's commerce entirely destroyed. The sea of "Pontus, nevertheless, is just as navigable at this hour as in "the days of *Polybius*." *

Bays, gulfs, and mediterranean seas, are no more the effects of irruptions of the Ocean into the Land, than mountains are productions of the centrifugal motion. These pretended disorders are necessary to the harmony of all the parts of the Earth. Let us suppose, for example, that the Straits of Gibraltar were closed, as it has been said was formerly the case, and that the Mediterranean existed no longer. What would become of so many rivers of Europe, Asia, and Africa, which are kept flowing by the vapours which ascend out of that Sea, and bring back their waters to it in a wonderful exactness of proportion, as the calculations of many ingenious men have demonstrated? The North winds which constantly refresh Egypt in Summer, and which convey the emanations of the Mediterranean as far as the mountains of Ethiopia, to supply the sour-

* Letter I. page 131.

ces of the Nile, blowing in this case over a space destitute of water, would carry drought and barrenness over all the northern regions of Africa, and even into the interior of that Continent.

The southern parts of Europe would fare still worse; for the hot and parching winds of Africa, which load themselves with so many rainy clouds as they cross the Mediterranean, now blowing over the dry bed of that Sea, without tempering the heat by humidity of any kind, would blast with scorching sterility all that vast region of Europe which extends from the Straits of Gibraltar to the Euxine Sea, and utterly dry up all the countries through which at present flow a multitude of rivers, such as the Rhone, the Po, the Danube, and the rest.

Besides, it is not sufficient to suppose that the Ocean forced a passage into the bed of the Mediterranean, as a river spreads over a champaign country after having overflowed it's banks; it must farther be supposed that the track of land inundated was lower than the Ocean, a phenomenon not to be met with in any other part of the *terra-firma*, all of which is above the level of the Sea, those parts excepted which have been wrested from the Deep by means of human industry, as is the case in Holland.

It must still farther be supposed that a lateral sinking of the Earth must have taken place all round the bason of Mediterranean to regulate the circuits, declivities, canals, and windings of so many rivers which come from such a distance to empty themselves into it, and that this sinking must have been effected with admirable proportions: for these rivers issuing in many cases from one and the same mountain, arrive by the same declivities to distances widely different without their channels ceasing to be full, or their waters flowing too fast or too slow, notwithstanding the difference of their courses and levels.

It is not then to an irruption of the Ocean that we are to ascribe the Mediterranean, but to an excavation of the Globe, more than twelve hundred leagues long and above eight hundred broad, which has been executed with dispositions so happy and so favourable to the circulation of so many lateral rivers, that if time permitted me to trace the course of any single one, it would be evident how destitute of all foundation the supposition is which I am combating. Earthquakes indeed produce excavations, but of small extent; and which far from forming

channels for rivers, sometimes absorb the course of rivulets, and change them into pools or marshes. These hypotheses may be applied to all gulphs, bays, great lakes, and mediterranean seas; and we shall be convinced that if these interior waters did not exist, not a fountain would remain in the greatest part of the habitable Globe.

If we would form a just idea of the order of Nature, we must give up our circumscribed ideas of human order. We must renounce the plans of our Architecture, which frequently employs straight lines, that the weakness of our sight may be enabled to take in the whole extent of our domain at a single glance; which symmetrizes all our distributions, and which in constructing our houses, places wings to the right and wings to the left, that all the parts of our habitation may be comprehended in a single view, while we occupy the centre; and which levels, fits to the plummet, smoothes and polishes the stones employed in building, that the monuments we raise may be soft to the eye and to the touch. The harmonies of Nature are not those of a Sybarite; but they are those of Mankind and of all beings. When Nature raises a rock, she introduces clefts, inequalities, points, perforations. She hollows and roughens it with the chisel of Time and of the Elements; she plants herbs and trees upon it; she stores it with animals, and places it in the bosom of the Sea in the very focus of storms and tempests, that it may there afford an asylum to the inhabitants of the Air and of the Waters.

When Nature in like manner intended to scoop out basons to receive the Seas, she neither rounded the borders nor applied the line to them; but contrived and produced deep bays, sheltered from the general currents of the Ocean, that during stormy weather the rivers might discharge themselves into it in security; that the finny legions might resort thither for refuge at all seasons, there lick up the illuvion of the earth, carried down by the fresh water; come thither to spawn, mounting upward and upward many of them toward the very source, where they can find both food and shelter for their young. And for the preservation of these adaptations it is that Nature has fortified every shore with long banks of sand, shelves, enormous rocks and islands, which are arranged round them at proper distances, to protect them from the fury of the Ocean.

She has employed similar dispositions in forming the beds of rivers, as we shall see in the sequel of this Study, though we have room only to glance at a subject so new and so fertile in observation. Accordingly she has made the current of rivers to flow not in a straight line, as they must have run had the laws of Hydraulics been observed, because of the tendency of their motions toward a single point; but she makes them wind about for a long time through the bosom of the land before they pour themselves into the Sea.

In order to regulate the course of those rivers, and to accelerate or retard it conformably to the level of the countries through which they flow, she pours into them lateral rivers, which accelerate it in a flat country when they form an acute angle with the source of the main river; or which retard it in a mountainous country, by forming a right and sometimes an obtuse angle with the source of the principal stream. These laws are so infallible, that a judgment may be formed simply from the map, whether the rivers which water any country are slow or rapid, and whether that country is flat or elevated, by the angles which the confluent rivers form with their courses.

Thus most of those which throw themselves into the Rhone form right angles with that rapid river to check it's impetuosity. Some of these confluent rivers are real dikes, which cross the main river from side to side in such a manner that the river crossed, which was running very rapidly above the confluence, flows very gently below it. This observation applies to many of the rivers of America, and remarkably to the Méchassipi. From these simple perceptions, which I have at present only time to indicate, it may be concluded that it is easy to retard or accelerate the course of a river, by simply changing the angle of incidence of it's confluent rivers. I produce this not as a matter of advice, but as a very curious speculation; for it is always dangerous for Man to derange the plans of Nature.

The rivers on throwing themselves into the Sea produce in their return, by the direction of their mouths, acceleration or retardation in the course of the tides. But I must not launch farther out into the study of these grand and sublime harmonies. I satisfy myself with having said enough to convince the candid

Reader, that the bed of the Seas was scooped out expressly for the purpose of receiving them.

Nevertheless I must produce one argument more, calculated to remove every possibility of doubt on the subject. Had the bed of the Seas been formed, as is supposed, by a sinking down of the solid parts of the Globe, the shores of the Sea under water would have the same declivities with the adjoining Continent. Now this is not found to be the case on any coast whatever. The declivity of the bason of the Sea is much steeper than that of the bounding lands, and by no means a prolongation of it. Paris, for example, is raised above the level of the Sea about 26 fathoms, reckoning from the base of the bridge of *No-tre-Dame*. The Seine accordingly, from this point to where it empties itself into the Sea, has a declivity of little more than 130 feet in a distance of forty leagues; whereas measuring from the mouth of the river out into the sea only a league and a half, you find at once an inclination of from 60 to 80 fathom, for this is the depth at which vessels anchor in the road of Havre-de-Grace.

These differences of level at land, from the level of the bed of the Sea in the same line of direction, are to be met with on all coasts more or less. *Dampier*, an English Navigator, has indeed observed, that Seas which wash steep coasts are much deeper; and that along flat shores their depth is small; but this striking difference is universally observable, that along flat coasts the bed of the Sea is much more inclined than the soil of the adjoining Continent, and that along high lands sometimes no bottom is to be found.

This clearly demonstrates therefore that the beds of the Seas were hollowed out expressly to contain them. The declivity of their excavations has been regulated by laws infinitely wise; for if it were the same with that of the adjacent Lands, the billows of the Sea whenever the wind blew toward the shore, however lightly, would considerably encroach on the Land. This actually happens in the case of storms and extraordinary tides, the waves overflow their usual bounds; for then meeting a declivity flat and gentle compared to that of their bed, they sometimes inundate the Land to the distance of several leagues. This happens from time to time in the island of Formosa, the natural ramparts of which, such as the manglier, the inhabitants it is probable formerly destroyed. Holland for nearly a similar

reason is exposed to inundations, because it has encroached on the very bed of the Sea.

It is principally on the shores of the Ocean that the invisible boundary is fixed which the AUTHOR of Nature has prescribed to its waves. It is there you perceive that you are at the intersection of two different planes, the one of which terminates the declivity of the Land, and the other commences that of the Sea.

It cannot be alleged that it was by currents of the Sea the bed was hollowed out; for where could the earth that filled it before be deposited? They could raise nothing above their own level. It cannot even be alleged that the channels of rivers have been excavated by the current of their own streams, for there are several which have found a subterraneous passage through masses of solid rock, so hard and so thick as to bid defiance to the pick-axes and the mattocks of our labourers. Besides, on the supposition which we are examining, these rivers must have formed at the place of their falling into the Ocean banks of sand, accumulations of earthy substances, of a magnitude proportional to the quantity of ground which they must have cleared away in forming their channels. Most of them, on the contrary, as has been already observed, empty themselves at the bottom of bays, hollowed out for the express purpose of receiving them.

How is it that they have not completely filled up those bays, as they are incessantly hurling down into them substances separated from the land? Why is not the very bed of the Ocean choaked up, from the constant accumulation of the spoils of vegetables, sands, rocks, and the wreck of earth which on every shower that falls tinge with yellow the rivers which fall into it? The waters of the Ocean have not risen a single inch since Man began to make observations, as might easily be demonstrated from the state of the most ancient sea-ports of the Globe, which are still for the most part at the same level.

Time permits me not to speak of the means employed by Nature, for the construction, the support, and the purification of this immense bason: they would suggest fresh subject of admiration. Enough has been said to prove that what in nature may appear to us the effect of ruin or chance, is in many cases the result of intelligence the most profound. Not only no hair falls from our head, and no sparrow from Heaven to the ground, but not a pebble rolls on the shore of the Ocean without the per-

mission of GOD: according to that sublime expression of Job: *Tempus posuit tenebris, & universorum finem Ipse considerat, lapidem quoque caliginis, & umbram mortis.** “He setteth an “end to darkness, and searcheth out all perfection; the stones “of darkness and the shadow of death:” He likewise knows the moment when that stone buried in darkness must spring into light, to serve as a monument to the Nations.

Independent of geographical proofs without number, which demonstrate that the ocean by its irruptions has not hollowed out one single bay on the face of the Globe, nor detached any one part of the Continent from the rest, there are still many more which may be deduced from the vegetable and animal kingdoms and from Man.

This is not the proper place for dwelling on the subject: but I shall quote on my way an observation from the vegetable World, which proves, for example, that Britain never was united to the European Continent, as has been supposed, but must have been from the beginning separated by the channel. It is a remark of Cæsar’s in his Commentaries, that during his stay in that Island he had never seen either the beech tree or the fir; though these trees were very common in Gaul along the banks of the Seine and of the Rhine. If therefore these rivers had ever flowed through any part of Britain, they must have carried with them the seeds of the vegetables which grew at their sources or upon their banks. The beech and the fir which at this day thrive exceedingly well in Britain, must of necessity have been found growing there in the time of Julius Cæsar, especially as they would not have changed their latitude, and being, as we shall see in the proper place, of the genus of fluviatic trees, the seeds of which resow themselves through the assistance of the waters. Besides, from whence could the Seine; the Rhine, the Thames, and so many other rivers, whose currents are supplied from the emanations of the Channel, from whence, I say, could they have been fed with water? The Thames then must have flowed through France, or the Seine through England; or, to speak more conformably to truth and nature, the countries now watered by these rivers would have been completely dry.

* Job xxviii. 3.

By our geographical charts, as by most other instruments of Science, we are misled. Observing in these so many retreatings and projections along the coasts of the Continent, we have been induced to imagine that these irregularities must have been occasioned by violent currents of the Sea. It has just been demonstrated that this effect *was* not thus produced; I now proceed to shew that it *could not possibly* have been the case.

The English *Dampier*, who is not the first Navigator that sailed round the Globe, but who is in my opinion the best of the travellers who have made observations on it, says in his excellent treatise on winds and tides: * “Bays scarcely have any currents, or if there be such a thing, they are only counter-currents running from one point to another.” He quotes many observations in proof of this, and many others of a similar nature are found scattered over the journals of other Navigators. Though he has treated only of the Currents between the Tropics, and even that with some degree of obscurity, we shall proceed to generalize this principle, and to apply it to the principal bays of Continents.

I reduce to two general Currents those of the Ocean. Both of these proceed from the Poles, and are produced in my opinion by the alternate fusion of their ices. Though this be not the place to examine the cause of it, to me it appears so natural, so new, and of such curious investigation, that the Reader, I flatter myself, will not be angry with me if I give him an idea of it on my way.

The Poles appear to me the sources of the Sea, as the icy mountains are the sources of the principal rivers. It is, if I am not mistaken, the snow and the ice which cover our Pole that annually renovate the waters of the Sea, comprehended between our Continent, and that of America, the projecting and retreating parts of which have besides a mutual correspondence, like the banks of a river.

It may be remarked at first sight, on a map of the World, that the bed of the Atlantic Ocean becomes narrower and narrower toward the North, and widens toward the South; and that the prominent part of Africa corresponds to that great retreating part of America, at the bottom of which is situated the

* Vol. ii. page 385.

Gulf of Mexico; as the prominent part of South America corresponds to the vast Gulf of Guinea; so that this bason has in its configuration the proportions, the sinuosities, the source, and the mouth of a vast fluviatic channel.

Let us now observe that the ices and snows form in the month of January on our Hemisphere a cupola, the arch of which extends more than two thousand leagues over the two Continents, with a thickness of some lines in Spain, of some inches in France, of several feet in Germany, of several fathoms in Russia, and of some hundreds of feet beyond the sixtieth degree of latitude, such as the ices which *Henry Ellis*,* and other Navigators of the North encountered there at Sea, even in the midst of Summer, and of which some, if *Ellis* is to be believed, were from fifteen to eighteen hundred feet above its level; for their elevation must probably go on encreasing, up to the very Pole, in conformity to the proportions observable in those which cover the summits of our icy mountains; which must give them, under the very Pole, a height which there is no possibility of determining.

From this simple outline, it is clearly perceptible what an enormous aggregation of water is fixed by the cold of Winter, in our Hemisphere, above the level of the Ocean. It is so very considerable, that I think myself warranted to ascribe to the periodical fusion of this ice, the general movement of our Ocean, and that of the tides. We may apply, in like manner, the effects of the fusion of the ices of the South Pole, which are there still more enormous, to the movements of its Ocean.

No conclusion has, hitherto, been drawn, relatively to the movements of the Sea, from the two masses of ice so considerable, alternately accumulated and dissolved at the two Poles of the World. They necessarily must, however, occasion a very perceptible augmentation of its waters, on their return to it, by the action of the Sun, which partly melts them once every year; and a great diminution, on being withdrawn, by the effect of the evaporations, which reduce them to ice at the Poles, when the Sun retires.

I proceed to lay before the Reader, some observations and reflections on this subject, which I have the confidence to call

* *Ellis's Voyage to Hudson's-Bay.*

highly interesting; and shall submit the decision to those who have not got into the trammels of system and party. I shall endeavour to abridge them to the utmost of my power, and flatter myself with the hope of forgiveness, at least, in consideration of their novelty. I am going to deduce, merely from the alternate dissolution of the polar ices, the general movements of the Seas, which have hitherto been ascribed to gravitation, or to the attraction of the Sun, and of the Moon, on the Equator.

It is impossible to deny, in the first place, that the Currents and the Tides come from the Pole, in the vicinity of the Polar Circle.

Frederic Martens, who, in his voyage to Spitzbergen, in 1671, advanced as far as to the eighty-first degree of northern latitude, positively asserts, that the Currents, amidst the ices, set in toward the South. He adds, farther, that he can affirm nothing with certainty respecting the flux and reflux of the Tides. Let this be carefully remarked.

Henry Ellis observed with astonishment, in his voyage to Hudson's-Bay, in 1746, and 1747, that the Tides there came from the North, and that they were accelerated, instead of being retarded, in proportion as the latitude increased. He assures us that these effects, so contrary to their effects on our coasts, where they come from the South, demonstrate that the Tides, in those high Latitudes, do not come from the Line, nor from the Atlantic Ocean. He ascribes them to a pretended communication between Hudson's-Bay and the South Sea: a communication which, with much ardour, he sought for, and which was indeed the object of his voyage; but now we have complete assurance that it does not exist, from the fruitless attempts lately made by Captain *Cook* to find it by the South Sea, to the north of California, in conformity to the advice, long before given respecting it, by the illustrious Navigator *Dampier*, whose sagacity and observations have, by the bye, greatly assisted Captain *Cook* in all his discoveries.

Ellis further observed, that the course of these northern Tides of America, was so violent at *Wager's Strait*, which is about 65 deg. 37 min. North Latitude, that it run at the rate of from eight to ten leagues an hour. He compares it to the sluice of a mill. He remarked that the surface of the water was there very fresh, which puzzled him exceedingly, by damping his hope of

a communication between this Bay and the South Seas. He remained, nevertheless, convinced of the existence of such a passage; such is the pertinacity of Man in favour of pre-convinced opinions, in the very face of evidence.

John Huguez de Linschoten, a Dutchman, had made nearly the same remarks on the currents of the northern Tides of Europe,* when he was at Waigats Straits, at 70 deg. 20 min. North Latitude. In the two voyages which that exact Observer made to this Strait, in 1594 and 1595, undertaken in the view of discovering a passage to China by the North of Europe, he repeated the same observations: "We observed," says he, "once more, from the course of the tide, what we had already remarked with much exactness, that it comes from the East." He likewise observed, that there the water was brackish, or half salt; this he ascribes to the fusion of a prodigious quantity of floating ice, which stopped his passage at Waigats Strait; for the ice formed even of sea-water is fresh. But *Linschoten* draws no conclusion, any more than *Ellis*, from these tides of water half fresh, which descend from the North; and full of his object, like the English Navigator, he ascribes them to a Sea, which he supposes open to the East, beyond Waigats Strait, through which he proposed to find his way to China.

His compatriot, the unfortunate *William Barents*,† who made the same voyage in the same fleet, but in another vessel, and who ended his days on the northern coasts of Nova Zembla. where he had wintered, found to the North and to the South of that island, a perpetual current of ice, setting in from the East, with a rapidity, which he compares, as *Ellis* does, to a sluice. Some of these ices were to 36 fathoms of depth under water, and 16 fathoms high above the surface. This was at Waigats Strait, in the months of July and August. He found there some Russian fishermen from Petzorah who navigated these Seas, covered with floating rocks of ice, in a boat made of the bark of trees sewed together. These poor people made presents of fat geese to the Dutch mariners with strong demonstrations of friendship; for calamity has in all Climates a powerful tendency to

* See the first and second Voyages to *Waigats*, by *H. J. Linschoten* Voyages to the North, vol. iv. page 204.

† Consult the second and third Voyages of the Dutch by the North, in the first volume of the Voyages of the East India Company.

conciliate affection between man and man. They informed him that this same Strait of Waigats, which was then disgorging such immense quantities of ice, would be entirely shut up toward the end of October, and that it would be possible to go into Tartary over the ice by what they called the Sea of Marmara.

It is incontrovertible that all these effects which I have been relating can proceed only from the effusions of the ices which surround the Pole. I shall here remark by the way that these ices, which flow with such rapidity to the north of America and of Europe towards the month of July and August, greatly contribute to our high equinoctial tides in September; and that when their effusions are stopped in the month of October, like those of Waigats, this too is the time when our Tides begin to diminish.

I may now be asked, Why the Tides come from the North and the East toward the north of America and of Europe; and from the South on our coasts, and on those of America which are under the same Latitudes?

I might satisfy myself with having said enough to demonstrate that all the Tides do not proceed from the pressure or the attraction of the Sun and of the moon on the Equator; I should have proved the imperfection of our scientific systems which ascribe them to these causes: but I proceed to repair what I have been pulling down by other observations; and to demonstrate that there is no one Tide on any coast whatever but what owes its origin to polar effusions.

An observation of *Dampier's** will serve at first as a basis to my reasonings. That careful and ingenious observer distinguishes between Currents and Tides. He lays it down as a principle founded on many experiments, of which he gives the history, that *Currents are scarcely ever felt but at Sea, and Tides upon the Coasts*. This being laid down: the polar effusions, which are the Tides of the North and of the East to those who are in the vicinity of the Poles, or of bays which have a communication with it, take their general course to the middle of the channel of the Atlantic Ocean, attracted toward the Line by the diminution of the waters which the Sun is there incessantly evaporating. They produce by their general

* See *Dampier's Treatise on Winds and Tides*.

ATLANTIC HEMISPHERE,

with its Channel its Ice, its Currents & its Tides in the Months of January & February.



Current two contrary Currents or collateral Whirlpools similar to those which rivers produce on their banks.

I am not taking for granted without any foundation the existence of these counter-currents or *vortices*, after the manner of System-makers, who create new causes in proportion as Nature presents them with new effects. These *vortices* are hydraulic re-actions, the laws of which Geometry explains, and the reality of which is completely ascertained by experience. If you look at a small running brook, you will frequently see straws floating along the brink, and carried upward in a direction opposite to the general current of the stream; and on arriving at the points where the counter-currents cross the general, you observe them agitated by these two opposed powers turning and spinning round a considerable time, till they are at last carried down the general current.

These counter-currents are still more preceptible, when such a rivulet flows through a bason which has itself no flux; for the re-action is in that case so considerable round the whole circumference of the bason, that the counter-currents carry about all bodies floating in it to the very place where the rivulet disengages itself.

These lateral counter-currents are so preceptible on the banks of rivers, that the watermen frequently take the advantage of them to make their way in the direction opposite to the general course. They are still more decidedly remarkable on the banks of lakes. Father *Charlevoix*, who has given us many judicious observations respecting Canada, informs us that when he embarked on lake Michigan he made out eight good leagues a day by the assistance of these lateral counter-currents, though the wind was contrary. He supposes, and with good reason, that the rivers which throw themselves into this lake produce in the middle of it's waters strong contrary currents: "But these strong currents," says he,* "are preceptible only in the middle of the channel, and produce on the banks *vortices* or counter-currents, of which those avail themselves who have to coast along the shore, as is the case with persons who are obliged to take the water in canoes made of bark."

Dampier's Work is filled with observations on counter-currents of the Ocean, which are very common, especially in the

* *Charlevoix*, History of New France Vol. vi. page 2.

straits of islands situated between the Tropics. He speaks frequently of the extraordinary effects produced by the meeting of the particular currents which occasion them; but as he does not consider the Tides themselves as *vortices* of the general Current of the Atlantic Ocean; and as I believe he did not so much as suspect the existence of it's general Current, though he has thoroughly investigated the two Currents or Monsoons of the Indian Ocean, I shall proceed to adduce certain facts which establish the most perfect conformity between the Atlantic Current and those which he himself observed in the Indian Ocean and in the South-Seas.

These facts will further prove to a demonstration the existence of those polar effusions: for universally wherever those effusions happen to meet in their progress southward, their own counter-currents which are setting in toward the North, they produce by their collision Tides the most tremendous, and whose direction is diametrically opposite.

Let us consider them only at their point of departure toward the North of Europe, where they begin to leave our coasts, and to stretch out into the open Sea. *Pont Oppidan* says, in his history of Norway, that there is above Berghen a place called *Malestrom*, very formidable to mariners, where the Sea forms a prodigious *vortex* of several miles diameter, in which a great many vessels have been swallowed up. *James Beverell** says positively that there are in the Orkney islands two opposite Tides, the one running from the North-West, and the other from the South-east; that they dash their roaring billows up to the clouds, and convert the separating strait into an enormous mass of foam. The Orkneys lie a little under the Latitude of Berghen, and in the prolongation of the northern coast of Norway, that is, at the confluence of the polar effusions and of their counter-currents.

Other islands of the Sea are in similar positions, as we could prove, did room permit. The channel of Bahama, for example, which runs with so much rapidity to the North, between the Continent of America and the Lucayo Islands, produces round those islands, by it's encountering the general Current of that Sea, Tides, the most tumultuous, and similar to those of the Orkneys.

* See *James Beverell*, Beauties of Scotland, vol. vii. page 1405.

These counter-currents to the course of the Atlantic Ocean produce then our European and American Tides, which set in to the North on the coast, while it's general Current runs southward, at least in the Summer time. I could adduce a thousand other observations respecting the existence of these contrary Currents ; but a single one, more general than those which I have quoted, will be sufficient for my purpose, both from it's importance and it's authenticity, being the first of all those which have been made in Europe, and perhaps the only one : it is that of *Christopher Columbus*, when setting out on the discovery of the New World.

He set sail from the Canaries about the beginning of September and steered to the West. He found, during the first days of his voyage, that the currents carried him to the North East. When he had advanced two or three hundred leagues from the land, he perceived that their direction was southward. This greatly terrified his companions, who believed that the Sea was there driving to a precipice. Finally, as he approached the Lucayo Islands, he again found the currents setting in to the northward. The journal of this important voyage may be found in *Herrera*.

My opinion is, that this general Current, which flows from our Pole in Summer with so much rapidity, and which is so violent towards it's source, according to the experience of *Ellis* and *Linschoten*, crosses the equinoctial Line, in as much as it's flux is not stemmed by the effusions of the South Pole, which at that season are consolidated into ice. I presume, for the same reason, that it extends beyond the Cape of Good Hope, from whence it is directed to the torrid Zone, from which it is attracted by the diminution of the waters which the Sun is there incessantly pumping up ; and that being directed eastward, by the position of Africa and Asia, it forces the Indian Ocean into the same direction, contrary to it's usual motion. I consider it therefore as the prime mover of the westerly Monsoon, which takes place in the Seas of India in the month of April, and ends not till the month of September.

I am likewise of opinion, that the general Current which issues during our Winter from the South Pole, at that time heated by the rays of the Sun, restores the Indian Ocean to it's natural motion westward, which is besides determined on this

side by the general impulsions of the easterly winds which usually blow in the torrid Zone, when nothing deranges their course. I farther presume that this current in it's turn penetrates into the Atlantic Ocean, directs it's motion northward by the position of America, and produces various other changes in our Tides.

In fact, *Froger* says that in Brasil the Currents follow the Sun. They run southward when he is in the South, and northward when he is in the North.* Those who have had experience of these effusions of the South Pole, beyond Cape Horn, have found that in the Summer of the Southern Hemisphere the Tides set in northward, as was observed by *William Schouten*, who in January 1661 discovered *Maire's-Strait*. But such, on the contrary, as have gone thither in the Winter of those regions, have found that the Tides run southward, and came from the North, as was observed by *Fraser* in the month of May of the year 1712.

It now seems to me possible to explain the principal phenomena of our Tides from these polar effusions. It will be evident, for example, why those of the evening should be stronger in Summer than those of the morning; because the Sun acts more powerfully by day than night on the ices of the Pole, which are on the same Meridian with ourselves. This effect resembles the intermittence of certain fountains which are supplied from mountains of ice, and flow more abundantly in the evening than in the morning. It will farther be evident, how it happens that our morning Tides in Winter rise higher than those of the evening; and why the order of our Tides changes at the end of every six months, as *Bouguer*† has well remarked, who thought the fact astonishing, but without assigning any reason for it; because the Sun being alternately toward both Poles, the effects of the Tides must necessarily be opposite, like the causes which produce them.

But I beg leave to suggest harmonies between the Ocean and the Poles still more extensive and more striking. At the Solstices the Tides are lower than at any other season of the year; and these likewise are the seasons when there is most ice on the two Poles, and consequently least water in the Sea. The rea-

* Voyage to the South Sea.

† *Bouguer*, Treatise of Navigation, page 153.

son is obvious. The Winter Solstice is, with respect to us, the season of the greatest cold; there is accordingly at that time on our Pole and on our Hemisphere the greatest possible accumulation of ice. It is indeed at the South Pole the Summer Solstice; but there is little ice melted on this Pole, because the action of the greatest heat is not felt there as with us, but when the Earth has an acquired heat, superadded to the actual heat of the Sun, which takes place only in the six weeks that follow the Summer Solstice; and these give us likewise in our Summer the hottest season of the year, which we call the Dog-Days.

At the Equinoxes, on the contrary, we have the highest Tides. And these are precisely the seasons when there is the least ice at the two Poles, and of course the greatest mass of water in the Ocean. At our autumnal Equinox, in September, the greatest part of the ices of the North Pole, which has undergone all the heats of Summer, is melted, and those of the South Pole begin to dissolve. It is farther remarkable, that the tides at our vernal Equinox, in March, rise higher than those of September, because it is the end of Summer to the South Pole, which contains much more ice than ours, and consequently sends to the ocean a much greater mass of water. And it contains more ice, because the Sun is six days less in that Hemisphere than in ours. If I am asked, Why the Sun does not communicate his light and heat in exactly equal proportions to both Poles? I shall leave it to the learned to assign the *cause*, but shall ascribe the *reason* of it to the Divine Goodness, which has been pleased to bestow the larger share of these blessings on that half of the Globe which contains the greatest quantity of dry land, and the greatest number of inhabitants.

I shall say nothing of the intermittence of these polar effusions, which produce on our coast two fluxes and two refluxes, nearly in the same time that the Sun, making the circuit of the Globe over our Hemisphere, alternately heats two Continents and two Oceans, that is, in the space of twenty-four hours, during which his influence twice acts, and is twice suspended. Neither shall I speak of their retardation, which is nearly three quarters of an hour from one day to another, and which seems to be regulated by the different diameters of the polar cupola of ice, the extremities of which, melted by the Sun, diminish and retire from us every day, and whose effusions must consequently require

more time to reach the Line, and to return from the Line to us. Neither shall I dwell on the other relations which these polar periods have to the phases of the Moon, especially when she is at the full; for her rays possess an evaporating heat, as the late experiments made at Rome and at Paris have demonstrated: for this would lay me under the necessity of detailing a series of observations and facts, which might carry me too far.

Much less shall I involve myself in a discussion of the Tides of the South Pole, which in the Summer of that Pole in the open Sea came immediately from the South and South-west in vast surges, conformably to the experience of the Dutch Navigator *Abel Tasman*, in the months of January and February 1692; and of their irregularity on the coasts of that Hemisphere, such as those on the coasts of New Holland, where *Dampier* in the month of January 1688 found to his great astonishment that the highest Tide, which set in from east-quarter-north, did not come till three days after full moon, and where his ship's company, struck with consternation, were for several days together under the apprehension that their vessel, which they had hauled up on the beach to be refitted, could never be got afloat again.* I shall say nothing of those of New Guinea, where toward the end of April the same Navigator experienced several, on the contrary, in the space of a single night, which extended, in direct opposition to ours, from North to South, and came from the West in very rapid swells tumultuous, and preceded by enormous surges which did not break; nor of the inconsiderable elevation of these Tides on the coast of Brasil, and in most of the islands of the South Sea, and of the East Indies, where they rise only five, six, seven feet, whereas *Ellis* found them twenty-five feet high at the entrance of Hudson's-Bay, and Sir *John Narbrough*, twenty feet at the entrance of Magellan's Straits.

Their course toward the Equator in the South Sea, their retardations and accelerations on those shores, their directions sometimes eastward, sometimes westward, according to the Monsoons; finally, their rise, which increases in proportion as we approach the Pole, and diminishes in proportion to our distance from it, even between the Tropics, demonstrate that their focus is not under the Line. The cause of their motions depends

* *Dampier's Voyages*: Treatise on Winds and Tides, pages 373 and 379

not on the attraction or the pressure of the Sun and of the Moon on that part of the Ocean; for these forces would undoubtedly act there with the greatest energy, and in periods as regular as the course of these two luminaries; but it seems to depend entirely on the combined heat of these same luminaries on the Poles of the Globe, the irregular effusions of which not being narrowed in the southern Hemisphere, as in ours, by the channel of two adjacent Continents, produce on the shores of the Indian Ocean and in the South Seas expansions vague and intermitting.

It is sufficient therefore to admit these alternate effusions of the polar ices, which it is impossible to call in question, to explain with the greatest facility all the phenomena of the Tides, and of the Currents of the Ocean. These phenomena present, in the journals of Navigators the most enlightened, a perpetual obscurity and a multitude of contradictions, as often as such Navigators persist in ascribing the causes of them to the constant pressure of the Moon and of the Sun on the Equator, without paying attention to the alternate Currents from the Poles, which direct their course to the Equator; to their counter-currents, which returning toward the Poles produce Tides; and to the revolutions which Winter and Summer effect on these two movements.

It has been supposed indeed in modern times that the Sea must be clear of ice under the Poles, and this is founded on the groundless assertion that the Sea freezes only along the shore; but this supposition is the creature of men in their closets, in contradiction to the experience of the most celebrated Navigators. The efforts of Captain *Cook* toward the South Pole demonstrate it's erroneousness. That intrepid mariner, in the month of February, the Dog-days of the Southern Hemisphere, never could approach nearer to that Pole, where there is no land, than the 70th degree of Latitude, that is, no nearer than five hundred leagues, though he had coasted round it's cupola of ice for a whole Summer; besides, this distance did not compose half the magnitude of the cupola, for he was permitted to advance so far only under favour of a bay, opened in a part of it's circumference, which every where else was of much greater extent.

These bays or openings are formed in the ice, merely by the influence of the nearest adjacent lands, where Nature has dis-

tributed sandy zones, to assist in accelerating the fusion of the polar ices at the proper season. Such are, to throw it out only on our way, for time permits me not here to unfold all the plans of this wonderful Architecture; such, I say, are those long belts of sand which encompass South America, in Magellan's Land; and those of Tartary, which commence in Africa, at Zara, or the Desert, and proceed forward till they terminate in the north of Asia. The winds in Summer convey the igneous particles with which those Zones are filled toward the Poles, where they accelerate the action of the Sun upon the ices.

It is easy to conceive, independent of experience, that the sands multiply the heat of the Sun, by the reflections of their specular and brilliant parts, and preserve it a long time in their interstices. It is certain, at least, that the greatest openings in the polar ices are always to be found in the direction of the warm winds, and under the influence of these sandy tracks of land, as I could easily demonstrate were this the proper place. But we may see examples of it without quitting our own Continent, nay, in our very gardens. In Russia, the rivers and lakes always begin to thaw at the banks, and the fusion of their ices is accelerated in proportion as the strand is more or less gravelly, and as they meet relatively to the stand in the direction of the South wind.

We observe the same effects in our own gardens towards the close of Winter. The ice which covers the gravel on the alleys melts first; afterward that which is on the earth, and last of all, that which is in the basons. The fusion of this too begins at the brink, and the length of time necessary to complete it is in proportion to the extent of the bason; so that the central part, or that which is farthest from the earth, is likewise the last that dissolves.

There can remain therefore not the slightest shadow of doubt that the Poles are covered with a cupola of ice, conformably to the experience of Navigators, and the dictates of natural reason. We have taken a glance of the icy dome of our own Pole, which covers it in winter to an extent of more than two thousand leagues over the Continents. It is not so easy to determine it's elevation at the centre, and under the very Pole; but the height must be immense.

Astronomy sometimes presents in the Heavens an image of it

so considerable, that the rotundity of the Earth seems to be remarkably affected by it.

I take the liberty of quoting what I find on this subject in an English Author of note, *Childrey*.* This naturalist supposes, as I do, that the Earth at the Poles is covered with ice to such a height that it's figure is thereby rendered sensibly oval. This he proves by two very curious astronomical observations. "What obliges me, besides," says he, "to embrace this paradox is, that it serves to resolve admirably well a difficulty of no small importance, which has greatly embarrassed *Tycho Brhae*, and *Kepler*, respecting central eclipses of the Moon, which take place near the Equator; as that was which *Tycho* observed in the year 1588, and that observed by *Kepler* in the year 1624: of which he thus speaks: *Notandum est hanc Lunæ eclipsim (instar illius quam Tycho, anno 1588, observavit totalem, & proximam centrali) egregiè calculum fefellisse; nam non solum mora totius Lunæ in tenebris brevis fuit, sed et duratio reliqua multo magis; perindè quasi tellus elliptica esset, demetientem breviorẽ habens sub Equatore, longiorẽ a polo uno ad alteram.* That is, *It is worthy of remark, that this eclipse of the Moon, (he is speaking of that of the 26th September, 1624) like the one which Tycho observed, in the year 1588, which was total, and very nearly central, differed widely from the calculation; for not only was the duration of total darkness extremely short, but the rest of the duration, previous and posterior to the total obscuration, was still shorter; as if the figure of the Earth were elliptical, having the smaller diameter under the Equator, and the greater from Pole to Pole.*"

The detached masses, half melted, which are every year torn from the circumference of this cupola, and which are met with floating at sea prodigiously distant from the Pole, about the 55th degree of Latitude, are of such an elevation, that *Ellis*, *Cook*, *Martens*, and other Navigators of the North and of the South, the most accurate in their details, represent them, at least as lofty as a ship under sail: nay, *Ellis*, as has already been mentioned, does not hesitate to assign to them an elevation of from 1500 to 1800 feet. They are unanimous in affirming, that these vast fragments emit corruscations, which render

* Natural History of England, pages 246 and 247.

them perceptible before they come to the Horizon. I shall remark by the way, that the *Aurora Borealis*, or Northern Light, may very probably owe it's origin to similar reflections from the polar ices, the elevation of which may perhaps one day be determined by the extent of these very lights.

Whatever may be in this, *Denis*, Governor of Canada, speaking of the ices which descend every summer from the North, upon the great bank of Newfoundland, says that they are higher than the turrets of Notre-Dame, and that they may be seen at the distance of from 15 to 18 leagues. Their cold is felt on ship-board at a similar distance. "They are," according to his own account,* "sometimes in such numbers, being all carried forward by the same wind, that there have been vessels, making toward the land to fish, which fell in with some of them in a series of a hundred and fifty leagues in length and upward; which vessels coasted along them for a day or two, the night included, with a fresh breeze, and every sail set, without being able to reach the extremity. In this manner they keep on under way, looking for an opening through which the vessel may pass; if they find one, they cross it, as through a strait; otherwise they must get on till they have outsailed the whole chain, in order to make good their passage; for the way is throughout blocked up with ice. These ices do not melt till they meet the warm water toward the South, or are forced by the wind on the land side. Some of them run aground in from 25 to 30 fathoms of water; judge of their depth, exclusive of what is above water. The fishermen have assured me that they saw one aground on the great bank, 45 fathoms water, and which was at least ten leagues round. It must have been of a great height. Ships do not come near those ices, for there is danger lest they should overturn, according as they dissolve on the side exposed to the greatest heat."

It is to be observed that the ices in question are already more than half melted by the time they reach the banks of Newfoundland; for in fact they scarcely go any farther. It is the Summer's heat which detaches them from the North, and they are enabled to make even such a progress southward only

* Natural History of North-America. Vol. ii. chap. i. pages 44 and 45.

by means of floating down the current, which carries them toward the Line, where they arrive in a state of dissolution, to replace the waters which the Sun is continually evaporating in the torrid Zone.

These polar ices, of which our mariners see only the borders and the crumbs, must have at their centre an elevation proportioned to their extent. For my own part, I consider the two Hemispheres of the Earth as two mountains with their bases applied to each other at the Line, the Poles as the icy summits of those mountains, and the Seas as rivers flowing from those summits.

If then we represent to ourselves the proportions which the glaciers of Switzerland have to their mountains, and to the rivers which flow from them, we shall be able to form some faint idea of those proportions which the glaciers of the Poles bear to the whole Globe and to the Ocean. The Cordeliers of Peru, which are only mole-hills, compared to the two Hemispheres, and the rivers which issue from them only rills of water compared to the Sea, having selvages of ice from twenty to thirty leagues broad, bristled at their centre with pyramids of snow from twelve to fifteen hundred fathoms high. What then must be the elevation of these two domes of polar ice, which have in Winter bases of two thousand leagues in diameter? I can have no doubt that their thickness at the Poles must have represented the Earth as oval, in central eclipses of the Moon, conformably to the observations of *Kepler* and *Tycho Brhae*.

I deduce another consequence from this configuration. If the elevation of the polar ices is capable of changing in the Heavens the apparent form of the Globe, their weight must be sufficiently considerable to produce some influence on it's motion in the Ecliptic. There is in fact a very singular correspondence between the movement by which the Earth alternately presents it's two Poles to the Sun in one year, and the alternate effusions of the polar ices, which take place in the course of the same year. Let me endeavour to explain my conception of the way in which the motion of the Earth is the effect of these effusions.

Admitting, with Astronomers, the laws of Attraction among the heavenly bodies, the Earth must certainly present to the

Sun, which attracts it, the weightiest part of it's Globc. Now this weightiest part must be one of it's Poles, when it is surcharged with a cupola of ice, of an extent of two thousand leagues, and of an elevation superior to that of the Continents. But as the ice of this Pole, which it's gravity inclines toward the Sun, melts in proportion to it's vertical approximation to the source of heat, and as, on the contrary, the ice of the opposite pole increases in proportion to it's removal, the necessary consequence must be, that the first Pole becoming lighter, and the second heavier, the centre of gravity passes alternately from the one to the other, and from this reciprocal preponderancy must ensue that motion of the Globe in the Ecliptic, which produces our Summer and Winter.

From this alternate preponderancy, it must likewise happen that our Hemisphere, containing more land than the southern Hemisphere, and being consequently heavier, it must incline toward the Sun for a greater length of time; and this too corresponds to the matter of fact, for our Summer is five or six days longer than our Winter. A farther consequence is, that our Pole cannot lose it's centre of gravity till the opposite Pole becomes loaded with a weight of ice superior to the gravity of our Continent, and of the ices of our Hemisphere; and this likewise is agreeable to fact, for the ices of the South Pole are more elevated and more extensive than those of the northern; for mariners have not been able to penetrate farther than to the 70th degree of South Latitude, whereas they have advanced no less than to 82° North.

Here we have a glimpse of the reasons by which Nature was determined to divide this Globe into two Hemispheres, of which the one should contain the greatest quantity of dry land, and the other the greatest quantity of water; to the end that this movement of the Globe should possess at once consistency and versatility. It is farther evident why the South Pole is placed immediately in the midst of the Seas, far from the vicinity of any land; that it might be able to load itself with a greater mass of marine evaporation, and that these evaporations accumulated into ice around it, might balance the weight of the Continents with which our Hemisphere is surcharged.

And here I lay my account with being opposed by a very formidable objection. It is this. If the polar effusions occa-

sion the Earth's motion in the Ecliptic, the moment would come in which, it's two Poles being in equilibrio, it could present to the Sun the Equator only.

I acknowledge that I have no reply to make to the difficulty alleged, unless this be admitted as such; We must have recourse to an immediate will of the AUTHOR of Nature, who is pleased to destroy the instant of this equilibrium, and who re-establishes the balancing of the Earth on it's Poles, by laws with which we are unacquainted. Now this concession no more weakens the probability of the hydraulic cause which I apply to it, than that of the principle of the attraction of the heavenly bodies, which attempts to explain it, I am bold to say, with much less clearness. This very attraction would soon deprive the Earth of all manner of motion, if it acted on the stars only. If we would be sincere, it is in the acknowledgment of an intelligence superior to our own, that all the mechanical causes of our most ingenious systems must issue. The will of GOD is the *ultimatum* of all human knowledge.

From this objection, however, I shall deduce consequences which will diffuse new light on the ancient effects of polar effusions, and on the manner in which they might have produced the Deluge.*

* The Priests of Egypt maintain, according to Herodotus, that the Sun had several times deviated from his course, accordingly our Hypothesis has nothing new in it. They had, perhaps, deduced the same consequences from this that we have done. One thing is certain; they believed that the earth would, one day, perish by a general conflagration, as it had been before overwhelmed by an universal deluge. Nay, I believe it was one of their Kings, who, as a security against either one or the other of these calamities, had two pyramids built, the one of brick, a preservative against fire; the other of stone, a preservative against an inundation. The opinion of a future conflagration of Nature is diffused over many nations. But effects so terrible, which would speedily result from the mechanical causes by which Man endeavours to explain the laws of Nature, can take place only by an immediate order of the DEITY. He preserves his works conformably to the same Wisdom with which they were created. Astronomers have for many Ages been observing the annual motion of the Earth in the Ecliptic, and never have they seen the Sun so much as a single second short of or beyond the Tropics. GOD governs the World by variable powers, and deduces from these harmonies which are invariable. The Sun neither moves in the circle of the Equator, which would set the Earth on fire, nor in that of the Meridian, which would produce an inundation of water; but his course is traced in the Ecliptic, describing a spiral line between the two Poles of the World

On the supposition then of the re-establishment of the equilibrium between the Poles, and of the Earth's constantly presenting it's Equator to the Sun, it is extremely probable that in this case it would be set on fire. In fact, on this hypothesis, the waters which are under the Equator, being evaporated by the unremitting action of the Sun, would become irrevocably fixed in ice at the Poles, where they would receive without effect the influence of that luminary, which would be to them constantly in the Horizon. The Continents being thus dried up, under the torrid Zone, and inflamed by a heat every day increasing, would quickly catch fire. Now, if it be probable that the Earth would perish by fire, were the Sun's motion confined to the Equator, it is no less probable that it must be deluged with waters if the course of the Sun were in the direction of the Meridian. Opposite means produce contrary effects.

We have just seen that the alternate effusions of part of the polar ices merely are sufficient for renewing all the waters of the Ocean, for producing all the phenomena of the Tides, and for effecting the balancing of the Earth in the Ecliptic. We believe them capable of entirely inundating the Globe, were the fusion to take place all at once. Let it be but remarked, that the effusion of only a part of the ices of the Cordeliers, in Peru, is sufficient to produce an annual overflow of the Amazon, of the Oroonoko, and of several other great rivers of the New World, and to inundate a great part of Brasil, of Guiana, and of the *Terra Firma* of America; that the melting of part of the snows on the mountains of the Moon in Africa, occasions every year the inundations of Senegal, contributes to those of the Nile, and overflows vast tracts of country in Guinea, and the whole of Lower Egypt; and that similar effects are annually reproduced in a considerable part of southern Asia, in the kingdoms of Bengal, of Siam, of Pegou, and of Cochin-China, and in the districts watered by the Tigris, the Euphrates, and many other rivers of Asia, which have their sources in chains of mountains perpetually covered with ice, namely, Taurus and

In this harmonious course he dispenses cold and heat, dryness and humidity, and derives from these powers, each of them destructive by itself, Latitudes so varied and so temperate all over the Globe, that an infinite number of creatures of an extreme delicacy find in them every degree of temperature adapted to the nature of their frail existence.

Imaus. Who then can entertain a doubt that the total fusion of the ices of both Poles, would be sufficient to swell the Ocean above every barrier, and completely to inundate the two Continents?

The elevation of these two cupolas of polar ice, vast as Oceans, must it not far surpass the height of the highest land, when the simple fragments of their extremities, after they are half dissolved, are as high as the turrets of Notre-Dame; nay, rise to the height of from fifteen to eighteen hundred feet above the Sea? The ground on which Paris stands, at forty leagues distance from the shore of the Sea, is only twenty-two fathom above the level of neap-tides, and no more than eighteen above the highest spring-tides. A great part of both the Old and of the New World is of an elevation much inferior even to this.

For my own part, if I may venture to declare my opinion, I ascribe the general Deluge to a total effusion of the polar ices, to which may be added that of the icy mountains, such as the ices of the Cordeliers and of Mount Taurus, the chains of which extend from twelve to fifteen hundred feet in length, with a breadth of twenty or thirty leagues, and an elevation of from twelve to fifteen hundred fathom. To these may be still farther added the waters diffused over the Atmosphere in clouds and imperceptible vapours, which would not fail to form a very considerable mass of water were they collected on the Earth.

My supposition then is, that at the epocha of this tremendous catastrophe, the Sun, deviating from the Ecliptic, advanced from South to North,* and pursued the direction of one of the Meridians which passes through the middle of the Atlantic Ocean and of the South-Sea. In this course he heated only a Zone of water, frozen as well as fluid, which through the

* I find an historical testimony in support of this hypothesis in the History of China, by Father *Martini*, Book I. "During the reign of *Yaus*, the seventh Emperor, the Annals of the Country relate, that for six days together the Sun never set, so that a general conflagration was apprehended." The result, on the contrary, was a deluge which inundated the whole of China. The epoch of this Chinese deluge, and that of the Universal Deluge, are in the same century. *Yaus* was born 2307 years before Christ, and the Universal Deluge happened 2348 years before the same epoch, according to the Hebrew computation. The Egyptians, likewise, had traditions respecting these ancient alterations of the Sun's course.

greatest part of the circumference has a breadth of two thousand five hundred leagues. He extracted long belts of land and sea-fogs, which accompany the melting of all ices, of the chain of the Cordeliers, of the different branches of the icy mountains of Mexico, of Taurus, and of Imaus, which like them run South and North; of the sides of Atlas, of the summits of Teneriff, of Mount Jura, of Ida, of Lebanon, and of all the mountains covered with snow, which lay exposed to his direct influence.

He quickly set on fire with his vertical flame the Constellation of the Bear, and that of the cross of the South; and presently the vast cupolas of ice on both Poles smoked on every side. All these vapours, united to those which arose out of the Ocean, covered the Earth with an universal rain. The action of the Sun's heat was farther augmented by that of the burning winds of the sandy Zones of Africa and Asia, which blowing, as all winds do, toward the parts of the Earth where the air is most rarefied, precipitated themselves, like battering rams of fire, toward the Poles of the World, where the Sun was then acting with all his energy.

Innumerable torrents immediately burst from the North Pole, which was then the most loaded with ice, as the Deluge commenced on the 17th of February, that season of the year when Winter has exerted it's full power over our Hemisphere. These torrents issued all at once from every floodgate of the North; from the straits of the Sea of Anadir, from the deep gulph of Kamtschatka, from the Baltic Sea, from the strait of Waigats, from the unknown sluices of Spitzbergen and Greenland, from Hudson's Bay, and from that of Baffin, which is still more remote. Their roaring currents rushed furiously down, partly through the channel of the Atlantic Ocean, hurled it up from the abysses of it's profound bason, drove impetuously beyond the Line, and their collateral counter-tides forced back upon them, and increased by the Currents from the South Pole, which had been set a-flowing at the same time, poured upon our coasts the most formidable of Tides. They rolled along in their surges a part of the spoils of the Ocean, situated between the ancient and the new Continent. They spread the vast beds of shells which pave the bottom of the Seas at the Antilles and Cape-de-Verd Islands, over the plains of Normandy; and carried

even those which adhere to the rocks of Magellan's Strait, as far as to the plains which are watered by the Saone. Encountered by the general Current of the Pole, they formed at their confluences horrible counter-tides, which conglomerated in their vast funnels, sands, flints, and marine bodies, into masses of indigested granite, into irregular hills, into pyramidal rocks, whose protuberances variegate the soil in many places of France and of Germany. These two general Currents of the Poles happening to meet between the Tropics, tore up from the bed of the Seas huge banks of madrepores, and tossed them, unseparated, on the shores of the adjacent islands, where they subsist to this day.*

In other places their waters slackened at the extremity of their course, spread themselves over the surface of the ground

* I have seen in the Isle of France some of these great beds of madrepores, of the height of seven or eight feet, resembling ramparts, left quite dry more than three hundred paces from the shore. The ocean has left on every land some traces of it's ancient excursions. There have been found, on the steep strand of the district of Caux, some of the shells peculiar to the Antilles Islands, particularly a very large one, called the *Thullee*; in the vineyards of Lyons, that which they call the cock and hen, which is caught alive in no Sea whatever but the Straits of Magellan; the teeth and jaws of sharks, in the sands of Estampes. Our quarries are filled with the spoils of the Southern Ocean. On the other hand, if we may believe the Memoirs of Father *le Comte*, the Jesuit, there are in China strata of vegetable earth from three to four hundred feet deep. The Missionary ascribes to these, and with good reason, the extreme fertility of that country. Our best soils in Europe are not above three or four feet deep. If we had Geographical Charts which should represent the different layers of our fossil shells, we might distinguish in them the directions and the focuses of the ancient currents which lodged them. I shall pursue this idea no further; but here is another, which may present new objects of curiosity to the learned, who put greater value on the monuments raised by Man, than on those of Nature. It is this, As we find in the fossils of these western regions a multitude of the monuments of the Sea, we might perhaps be able to trace those of our ancient Continent, in those strata of vegetable earth, of three and four hundred feet depth, in the countries of the East. First, it is certain, from the testimony of the Missionary above quoted, that pit-coal is so common in China, that most of the Chinese make use of no other fuel. Now, it is well known that pit-coal owes it's origin to the forests which have been buried in the bowels of the Earth. It might be possible, therefore, to find amidst these wrecks of the vegetable creation those of terrestrial animals, of men, and of the first arts of the World, such at least as possessed some degree of solidity.

in vast sheets, and deposited, by repeated undulations, in horizontal layers, the wreck and the vicissitudes of an infinite number of fishes, sea-urchins, sea-weeds, shells, corals, and formed them into strata of gravel, pastes of marble, of marle, of plaster and calcareous stones, which constitute to this day the soil of a considerable part of Europe. Every layer of our fossils was the effect of an universal Tide. While the effusions of the polar ices were covering the westerly extremities of our Continent with the spoils of the Ocean, they were spreading over it's easterly extremities those of the Land, and deposited on the soil of China strata of vegetable earth, from three to four hundred feet deep.

Then it was that all the plans of Nature were reversed. Complete islands of floating ice, loaded with white bears, run aground among the palm-trees of the torrid Zone, and the elephants of Africa were tossed amidst the fir-groves of Siberia, where their large bones are still found to this day. The vast plains of the Land, inundated by the waters, no longer presented a career to the nimble courser, and those of the Sea, roused into fury, ceased to be navigable. In vain did Man think of flying for safety to the lofty mountains. Thousands of torrents rushed down their sides, and mingled the confused noise of their waters with the howling of the winds and the roaring of the thunder. Black tempests gathered round their summits, and diffused a night of horror in the very midst of day. In vain did he turn an eager eye toward that quarter of the Heavens where Aurora was to have appeared: he perceives nothing in the whole circuit of the Horizon but piles of dark clouds heaped upon each other; a pale glare here and there furrows their gloomy and endless battalions; and the Orb of Day, veiled by their lurid corruscations, emits scarcely light sufficient to afford a glimpse in the firmament of his bloody disk, wading through new Constellations. .

To the disorder reigning in the Heavens, Man, in despair, yields up the safety of the Earth. Unable to find in himself the last consolation of Virtue, that of perishing free from the remorse of a guilty conscience, he seeks at least to conclude his last moments in the bosom of Love or of Friendship. But in that age of criminality, when all the sentiments of nature were stifled, friend repelled friend, the mother her child, the husband

the wife of his bosom. Every thing was swallowed up by the waters: cities, palaces, majestic pyramids, triumphal arches, embellished with the trophies of Kings: and ye also which ought to have survived the ruin even of a World, ye peaceful grottos, tranquil bowers, humble cottages, the retreat of innocence! There remained on the Earth no trace of the glory and felicity of the Human Race in those days of vengeance, when Nature involved in one ruin all the monuments of her greatness.

Such convulsions, of which traces without number still remain on the surface, and in the bowels of the Earth, could not possibly have been produced simply by the action of an universal rain.

I am aware that the letter of Scripture is express in respect to this; but the circumstances which the Sacred Historian combines, seem to admit the means which, on my hypothesis, effected that tremendous revolution.

In the book of Genesis it is said, that it rained over the whole Earth for forty days and forty nights. That rain, as we have alleged, was the result of the vapours produced by the melting of the ices, both of the Land and of the Sea, and by the Zone of Water which the Sun passed over, in the direction of the Meridian. As to the period of forty days, that quantity of time appears to me abundantly sufficient to the vertical action of the Sun on the polar ices, to reduce them to the level of the Seas, as scarcely more than three weeks are necessary, of the proximity of the Sun to the Tropic of Cancer, to melt a considerable part of those on our pole. Nay, at that season, nothing more seems to be wanting but a few puffs of southerly or south-west wind for a few days to disengage from the ice the southern coast of Nova-Zembla, and to clear the strait of Waigats, as has been observed by *Martens*, *Barents*, and other Navigators of the North.

It is farther said, in the Book of Genesis, “all the *fountains of the great Deep* were broken up, and the *windows of Heaven* were opened.” The expression, *the fountains of the great Deep*, can, in my opinion, be applied only to an effusion of the polar ices, which are the real effusions of the Sea, as the effusions of the ice on mountains are the sources of all the great rivers. The expression, *the windows*, or cataracts, *of Heaven*, denotes likewise, if I am not mistaken, the universal solution of

the waters diffused over the Atmosphere, which are there supported by the cold, the focuses of which were then destroyed at the Poles.

It is afterwards said, in Genesis, that after it had rained for forty days, GOD *made a wind to blow*, which caused the waters that covered the Earth to disappear. This wind undoubtedly brought back to the Poles the evaporations of the Ocean, which fixed themselves a-new in ice. The Mosaic account, finally, adds circumstances which seem to refer all the effects of this wind to the Poles of the World, for it is said, Gen. viii. 2, 3. "The fountains also of the Deep, and the windows of Heaven were stopped, and the rain from Heaven was restrained; and *the waters returned from off the Earth continually*, and after *the end of the hundred and fifty days* the waters were abated."

The agitation of these waters from side to side continually, perfectly agrees to the motion of the Seas from the Line to the Poles, which must then have been performed without any obstacle, the Globe being on that occasion entirely aquatic; and it being possible to suppose that it's annual balancing in the Ecliptic, of which the polar ices are at once the moving power and the counterpoise, had degenerated at that time into a diurnal titubation, a consequence of it's first motion. These waters retired then from the Ocean, when they came to be converted a-new into ice upon the Poles; and it is worthy of remark, that the space of a hundred and fifty days, which they took to fix themselves in their former station, is precisely the time which each of the Poles annually employs, to load itself with it's periodical congelations.

We find, besides, in the sequel of this historical account of the Deluge, expressions analagous to the same causes: "GOD said again to Noah, while the Earth remaineth, seed time and harvest, and cold, and heat, and Summer, and Winter, and day and night, shall not cease." *

There must be nothing superfluous in the *Words* of the Author of Nature, as there is nothing of this description in his *Works*. The deluge, as has been already mentioned, commenced on the seventeenth day of the second month of the year, which was among the Hebrews, as with us, the month of February.

* Gen. ch. viii. ver. 22.

Man had by this time cast the seed into the ground, but reaped not the harvest. That year cold succeeded not to the heat, nor Summer to Winter, because there was neither Winter nor cold, from the general fusion of the polar ices, which are their natural focusses ; and the night, properly so called, did not follow the day, because then there was no night at the poles, where there is alternately one of six months, because the Sun, pursuing the direction of a Meridian, illuminated the whole Earth, as is the case now when he is in the equator.

To the authority of Genesis, I shall subjoin a very curious passage from the Book of Job,* which describes the Deluge and the Poles of the World, with the principal characters of them which I have just been exhibiting.

4. Ubi eras quando ponebam fundamenta Terræ ? Indica Mihi, si habes intelligentiam.

5. Quis posuit mensuras ejus, si nosti ? Vel quis tetendit super eam, lineam ?

6. Super quo bases illius solidatæ sunt ? Aut quis demisit lapidem angularem ejus,

7. Cum manè laudarent simul Astra matutina, & jubilarent, omnes Filii DEI ?

8. Quis conclusit ostiis † Mare, quando erumpebat quasi ex utero procedens :

* Ch. xxxviii.

† Though the sense which I affix to this passage does not greatly differ from that of *M de Saci*, in his excellent translation of the Bible, there are, at the same time, several expressions, to which I assign a meaning rather opposite to that of this learned Gentleman.

1st. *Ostium*, properly speaking, signifies an opening, a disgorging, a sluice, a flood-gate, a mouth ; and not a barrier, according to *Saci's* translation. Observe how admirably the sense of this verse, and of that which follows, is adapted to the state of constraint and activity to which the Sea is restricted at the Poles, surrounded with clouds and darkness, like a child in swaddling clothes in his cradle. They are likewise expressive of the thick fogs which surround the basis of the polar ices, as is well known to all the mariners of the North.

2dly. The preceding epithets of *the foundations of the Earth* ; of *the fastening of the foundations* ; of *stretching the line upon it* ; of *the Sea's breaking forth*, as if issuing from the womb, determine particularly the Poles of the World, from whence the Seas flow over the rest of the Globe. The epithet of *corner stone*, seems likewise to denote more particularly the North Pole, which, by it's magnetic attraction, distinguishes itself from every other point of the Earth.

9. Cum ponerem nubem vestimentum ejus, & caligine, illud, quasi pannis infantia, obvolverem ?

10. Circumdedi illud terminis meis, & posui vectem & ostia :

11. Et dixi : usque huc venies, sed non procedes amplius ; & hic confringes tumentes fluctus tuos.

12. Numquid post ortuum præcepisti diliculo, & ostendisti Auroræ, * locum suum ?

13. Et tenuisti concutiens extrema Terræ, & excussisti impios ex ea ?

14. Restituetur ut lutum † signaculum, & stabit sicut vestimentum.

15. Auferetur ab impiis lux sua, & brachium excelsum confringetur.

16. Numquid ingressus es profunda Maris, & in novissimis Abyssi ‡ deambulasti ?

17. Numquid apertæ sunt tibi portæ Mortis, § & ostia tenebrosa vidisti ?

* *Auroræ locum suum*, the place of the Aurora. The *Aurora Borealis* is perhaps here intended. The cold of the Poles produces the Aurora, for there is scarce any such thing between the Tropics. The Pole is accordingly, properly speaking, the natural place of the Aurora. In the verse following, the expression, *tenuisti concutiens extrema Terræ* evidently characterizes the total effusions of the polar ices, situated at the extremities of the Earth, which occasioned the Universal Deluge.

† *Restituetur ut lutum signaculum*. This verse is very obscure in the Translation of M. de Saci. It appears to me here descriptive of the fossil shells, which over the whole Earth are monuments of the Deluge.

‡ *In novissimis Abyssi*, in the search (at the sources) of the Depth. Saci translates it, *in the extremities of the Abyss*. This version destroys the correspondence of the expression under review, with that of the other polar characters, so clearly explained before ; and the antithesis of *novissima*, with that of *profunda Maris*, which goes before, by affixing the same meaning to it. Antithesis is a figure in frequent use among the Orientals, and especially in the Book of Job. *Novissima Abyssi*, literally denote the places which renovate the Abyss, the sources of the Sea, and consequently the polar ices.

§ *Portæ Mortis, & ostia tenebrosa* ; the gates of Death, and the doors of the shadow of Death, or, the gates of Darkness. The Poles, being uninhabitable, are in reality the gates of Death. The epithet *dark* here denotes the nights of six months duration, which hold their empire at the Poles. This sense is farther confirmed by what is subjoined in the following verses ; the *locus tenebrarum*, place of darkness, and the *thesaurus nivis*, treasure of the snow. The Poles are at once the place of darkness, and that of the Aurora.

18. Numquid considerasti latitudinem Terræ? * Indica Mihi, si nosti omnia.

19. In qua via lux habitat, et tenebrarum quis locus sit.

20. Ut ducas unumquodque ad terminos suos, & intelligas semitas domus ejus.

21. Sciebas tunc quod nasciturus esses? Et numerum dierum tuorum noveras.

22. Numquid ingressus es thesauros nivis, aut thesauros gran-
dinis aspexisti.

23. Quæ preparavi in tempus hostis, in diem pugnæ & belli.

Common Version of the Bible.

4. Where wast thou, when I laid the foundations of the Earth? Declare, if thou hast understanding.

5. Who hath laid the measures thereof; if thou knowest? Or who hath stretched the line upon it?

6. Whereupon are the foundations thereof fastened? Or who laid the corner-stone thereof?

7. When the morning stars sang together, and all the sons of GOD shouted for joy.

8. Or who shut up the Sea with doors, when it brake forth, as if it had issued out of the womb?

9. When I made the cloud the garment thereof, and thick darkness a swaddling band for it,

10. And brake up for it my decreed place, and set bars and doors,

11. And said, Hitherto shalt thou come, but no farther: and here shall thy proud waves be staid.

Translation of Saint-Pierre's Version.

4. Where wast thou when I laid the foundations of the Earth? Tell it Me, if thou hast any knowledge.

5. Knowest thou who it is that determined it's dimensions, and who regulated it's levels?

6. On what are its bases secured; and who fixed it's corner-stone?

7. When the Stars of the morning praised Me all together, and when all the Sons of GOD were transported with joy.

8. Who appointed gates to the Sea, to shut it up again, when it inundated the Earth, rushing as from it's mother's womb;

9. When I gave it the clouds for a covering, and wrapped it up in darkness, as a child is wrapped up in swaddling clothes?

10. I shut it up within bounds well-known to me; I appointed for it a bulwark and sluices,

11. And said to it, Thus far shalt thou come, but farther thou shalt not pass, and here the pride of thy billows shall be broken.

* *Latitudinem Terræ.* Literally: *Hast thou perceived the breadth* (the Latitude) *of the Earth?* In truth, all the characters of the Pole could be known only to those who had coursed over the Earth in it's Latitude. There were, in the times of Job, many Arabian travellers who went eastward, and westward, and southward, but very few who had travelled northward, that is to say, in Latitude

12. Hast thou commanded the morning since thy days ? and caused the day-spring to know his place,

13. That it might take hold of the ends of the earth, that the wicked might be shaken out of it ?

14. It is turned as clay to the seal, and they stand as a garment.

15. And from the wicked their light is with-holden, and the high arm shall be broken.

16. Hast thou entered into the springs of the Sea ? or hast thou walked in the search of the Depth ?

17. Have the gates of Death been opened unto thee ? or hast thou seen the doors of the shadow of Death ?

18. Hast thou perceived the breadth of the Earth ? Declare if thou knowest it all.

19. Where is the way where light dwelleth ? and as for darkness, where is the place thereof ?

20. That thou shouldest take it to the bound thereof, and that thou shouldest know the paths to the house thereof ?

21. Knowest thou it, because thou wast then born ? or because the number of thy days is great ?

22. Hast thou entered into the treasures of the snow ? Or, hast thou seen the treasures of the hail ?

23. Which I have reserved against the time of trouble, against the day of battle and war ?

12. Is it thou who, in opening thine eyes to the light, hast given commandment to the dawning of the day to appear, and hast shewn to Aurora the place where she ought to arise ?

13. Is it thou who, holding in thy hands the extremities of the Earth, hast convulsed it, and shaken the wicked out of it ?

14. A multitude of minute monuments of this event shall remain impressed in the clay, and shall subsist as the memorials of that devastation.

15. The light of the wicked shall be taken from them, and their lifted up arm shall be broken.

16. Hast thou penetrated to the bottom of the Sea, and walked over the sources which renovate the Abyss ?

17. Have these gates of Death been opened to thee : and hast thou surveyed the dark disgorgings of the Depth ?

18. Hast thou observed where the breadth of the Earth terminates ? If thou knowest all these these things, declare them unto Me.

19. Tell me where the light inhabits, and what is the place of darkness,

20. That thou mayest conduct each to it's destination, seeing thou knowest their habitation, and the way that leads to it.

21. Didst thou know, as these things already existed, that thou thyself wert to be born ; and hadst then discovered the fleeting number of thy days ?

22, 23. Hast thou, I say, entered into the treasures of the snow, and surveyed those tremendous reservoirs of hail, which I have prepared against the time of the adversary, and for the day of battle and war ?

The Reader, I flatter myself, will not be displeased at my having deviated somewhat from my subject, that I might exhibit to him the agreement between my hypothesis and the traditions of the Holy Scriptures; and especially between it and those, though not free from obscurity, of a Book perhaps the most ancient that exists. Our most learned Theologians agree in thinking that Job wrote prior to Moses. Whether this be the case or not, surely no one ever painted Nature with greater sublimity.

We may, farther, arrive at complete assurance of the general effect of the polar effusions on the Ocean, from the particular effects of the icy effusions of the mountains on the lakes and rivers of the Continent. I shall here relate some examples of these last; for the human mind, from it's natural weakness, loves to particularize all the objects of it's studies. And this is the reason why it apprehends much more quickly the laws of Nature in small objects, than in those which are great.

Addison, in his remarks on *Misson's Tour to Italy*, page 322, says, that there is in the lake of Geneva, in Summer, towards evening, a kind of flux and re-flux, occasioned by the melting of the snows, which fall into it in greater quantities after noon than at other seasons of the day. He explains besides, with much clearness, as he generally does, from the alternate effusions of the ices on the mountains of Switzerland, the intermittence of certain fountains of that country, which flow only at particular hours of the day.

If this digression were not already too long, I could demonstrate that there is no one fountain, nor lake, nor river, subject to a particular flux and reflux, but what is indebted for it to icy mountains, which supply it's sources. I shall subjoin but a very few words more respecting those of the Euripus; the frequent and irregular movements of which so much embarrassed the Philosophers of Antiquity, and which may be so easily explained from the icy effusions of the neighbouring mountains.

The Euripus, it is well known, is a strait of the Archipelago which separates the ancient Beotia from the island of Eubea, now Negropont. About the middle of this strait, where it is narrowest, the water is known to flow, sometimes to the North, sometimes to the South, ten, twelve, fourteen times a day, with

the rapidity of a torrent. These multiplied, and very frequently unequal movements, cannot possibly be referred to the tides of the Ocean, which are scarcely perceptible in the Mediterranean. A Jesuit, quoted by *Spon*,* endeavours to reconcile these to the phases of the Moon; but supposing the table of them, which he produces, to be accurate, their regularity and irregularity will always remain a difficulty of no easy solution. He refutes *Seneca*, the Tragic Poet, who ascribes to the Euripus but seven fluxes in the day time only:

Dum lassa Titan mergat Oceano juga.

Till Titan's tired steeds in th' Ocean plunge.

He adds farther, I know not after whom, that in the Sea of Persia the flux never takes place but in the night-time; and that under the Arctic Pole, on the contrary, it is perceptible twice in the day-time, without being ever observed in the night. It is not so, says he, with the Euripus.

I shall observe, by the way, that his remark with respect to the pole, supposing it true, evinces that it's two diurnal fluxes are the effects of the Sun, who acts only during the day on the two icy extremities of the Continents of the New World, and of the Old. As to the Euripus, the variety, the number, and the rapidity of it's fluxes, prove that they have their origin in like manner in icy mountains, situated at different distances, and under different aspects of the Sun. For, according to that same Jesuit, the island of Eubea, which is on one side of the strait, contains mountains covered with snow for six months of the year; and we know equally well that Beotia, which is on the other side, contains several mountains of an equal elevation, and even some which are crowned with ice all the year round, such as Mount Oeta. If these fluxes and refluxes of the Euripus take place as frequently in Winter, which is not affirmed, the cause of them must be ascribed to the rains which fall at that season of the year on the summits of these lofty collateral mountains.

I shall enable the Reader to form an idea of these not very apparent causes of the movements of the Euripus, by here transcribing what *Spon* relates in another place,† of the Lake of Li-

* Voyage to Greece and the Levant, by *Spon*, vol. ii. page 340.

† Voyage to Greece and the Levant, by *Spon*, vol. ii. pages 88 and 89.

vidia, or Copaide, which is in it's vicinity. This lake receives the first fluxes of the icy effusions of the mountains of Beotia, and communicates them undoubtedly to the Euripus, through the mountain which separates them. "It receives," says he, "several small rivers, the Cephissus and others, which water that beautiful plain, whose circumference is about fifteen leagues and abounds in corn and pasture. Besides, it was formerly one of the most populous regions of Beotia, But the water of this lake sometimes swells so violently by the rains and melted snows, that it once inundated two hundred villages of the plain. It would even be capable of producing a regular annual inundation, if Nature, assisted perhaps by Art,*

* *Spon* undoubtedly did not consider what he was saying, when he suggested an idea of the possibility of Art assisting Nature in the construction of five subterranean canals, each ten miles long, through a solid rock. These subterranean canals are frequently met with in mountainous countries, of which I could produce a thousand instances. They contribute to the circulation of waters, which could not otherwise force a passage through extended chains of mountains. Nature pierces the rocks, and sends rivers through the apertures, just as she has pierced several of the bones of the human body, for the purpose of transmitting certain veins. I leave to the Reader the prosecution of this new idea. I have said enough to convince him that this Globe is not the production of disorder or chance.

I shall conclude these observations with a reflection respecting the two Travellers whom I have been quoting : it may perhaps have a good moral effect. *Spon* was a Frenchman, and *George Wheeler* English. They travelled in company over the Archipelago. The former brought home with him a great collection of Greek inscriptions and epitaphs ; and the literati of the last age cried him up highly. The other has given us the names and characters of a great many very curious plants which grow on the ruins of Greece, and which, in my opinion, convey a very affecting interest into his relations. He is little known among us.

According to the descriptive titles which each of these Gentlemen assumed, *Jacob Spon* was a Physician associate of Lyons, and an eager investigator of the monuments of men. *George Wheeler* was a Country Gentleman, and enthusiastically attached to those of Nature. Their tastes, to judge from situations, ought to have been reversed ; and that the Gentleman should have been fond of monumental inscriptions, and the Physician of plants ; but, as we shall have occasion to observe in the sequel of these Studies, our passions spring out of contrarieties, and are almost always in opposition to our conditions. It was from an effect of this harmonic law of Nature that, though these travellers were, the one English, and the other French, they lived in the most perfect union. I remark, to their honour, that they quote each other in terms of the highest respect and approbation.

Ministers of State, would ye form Societies which shall be cordially united among themselves, do not assort Academicians with Academicians, Soldiers

“ had not contrived for it an outlet, by five great canals, under
 “ the adjacent mountain of the Euripus, between Negropont
 “ and Talanda, through which the water of the lake is gulped up,
 “ and throws itself into the Sea on the opposite side of the moun-
 “ tain. The Greeks call this place *Catabathra* : (the whirlpools.)
 “ Strabo, speaking of this lake, says, nevertheless, that there
 “ appeared no outlet in his time, unless it be that the Cephisus
 “ sometimes forced a passage under ground. But it is only ne-
 “ cessary to read the account which he gives of the changes that
 “ take place in this morass, not to be surprised at what he has
 “ affirmed of it's outlets. Mr. *Wheeler*, who went to examine
 “ this spot after my departure from Greece, says it is one of the
 “ greatest curiosities in the country, the mountain being near ten
 “ miles broad, and almost entirely one mass of solid rock.”

I have no doubt that several objections may be started against the hasty explanation which has been given of the course of the Tides, of the Earth's motion in the Ecliptic, and of the Universal Deluge, occasioned by the effusions of the polar ices ; but, I have the courage to repeat it, these physical causes present themselves with a higher degree of probability, of simplicity, and of conformity to the general progress of Nature, than the astronomical causes, so far beyond our reach, by which attempts have been made to explain them. It belongs to the impartial Reader to decide. If he is on his guard against the novelty of systems, which are not yet supported by puffers, he ought to be no less so against the antiquity of those which have many such supporters.

Let us now return to the form of the great bason of the Ocean. Two principal Currents cross it from East to West, and from North to South. The first, coming from the South Pole, puts in motion the Seas of India, and, directed along the eastern extent of the Old Continent, runs from East to West, and from West to East, in the course of the same year, forming in the Indian Ocean what are called the Monsoons. This we have already remarked ; but what has not been hitherto brought

with Soldiers, Merchants with Merchants, Monks with Monks, but associate Men of opposite conditions, and you will behold harmony pervade the association ; provided, however, that you exclude the ambitious, which is indeed no easy task, ambition being one of the first vices which our mode of education instils.

forward, though it well deserves to be so, is, that all the bays, creeks, and mediterraneans of southern Asia, such as the gulfs of Siam and Bengal, the Persian Gulf, the Red Sea, and a great many others, are directed relatively to this Current, North and South, so as not to be stemmed by it.

The second Current in like manner issuing from the North Pole, gives an opposite movement to our Ocean, and, inclosed between the Continent of America and ours, proceeds from North to South, and returns from South to North in the same year, forming, like that of India, real Monsoons, though not so carefully observed by Navigators. All the bays and mediterraneans of Europe, as the Baltic, the Channel, the Bay of Biscay, the Mediterranean properly so called; and all those on the eastern coast of America, as the Bay of Baffin, Hudson's-Bay, the Gulf of Mexico, as well as many others which might be mentioned, are directed, relatively to this Current, East and West; or, to speak with more precision, the *axes* of all the openings of the Land in the Old and New Worlds, are perpendicular to the *axes* of those general Currents, so that their mouth only is crossed by them, and their depth is not exposed to the impulsions of the general movements of the Ocean.

It is because of the calmness of bays, that so many vessels run thither in quest of anchoring ground; and it is for this reason that Nature has placed in their bottoms the mouths of most rivers, as we before observed, that their waters might be discharged into the Ocean, without being driven furiously back by the direction of it's Currents. She has employed similar precautions for the security of even the smallest streams which empty themselves into the Sea. There is not a single experienced seaman who does not know that there is scarcely a creek but what has it's little rivulet. But for the Wisdom apparent in these dispositions, the streams destined to water the Earth must frequently have deluged it.

Nature employs still other means for securing the course of rivers, and especially for protecting their discharges into the Sea. The chief of these are islands. Islands present to the rivers channels of different directions, that if the Winds or the Currents of the Ocean should block up one of their outlets, the waters might have a free passage through another. It may be remarked, that she has multiplied islands at the mouths of rivers

the most exposed to this two-fold inconveniency; such as, for example, at that of the Amazon, which is for ever attacked by the East wind, and situated on one of the most prominent parts of America. There they are so many in number, and form with each other channels of such different courses, that one outlet points North-east, and another South-east, and from the first to the last the distance is upward of a hundred leagues.

Fluviatic islands are not formed, as has been currently believed, of solid substances washed down by rivers, and aggregated: they are, on the contrary, for the most part, very much elevated above the level of these rivers, and many of them contain rivers and mountains of their own. Such elevated islands are, besides, frequently found at the confluence of a smaller and a greater river. They serve to facilitate their communication, and to open a double passage to the current of the smaller river. As often then as you see islands in the channel of a great river, you may be assured there is some lateral inferior river or rivulet in the vicinity.

There are in truth many of these confluent rivulets which have been dried up by the ill-advised labours of men, but you will always find opposite to the islands which divided their confluence a correspondent valley, in which you may trace their ancient channel. There are likewise some of these islands in the midst of the course of rivers, in places exposed to the winds. I shall observe by the way, that we recede very widely from the intentions of Nature, in re-uniting the islands of a river to the adjoining Continent; for it's waters, in this case, flow in only one single channel, and when the winds happen to blow in opposition to the current, they can escape neither to the right nor to the left; they swell, they overflow, inundate the plains, carry away the bridges, and occasion most of the ravages which in modern times so frequently endamage our cities.

We do not then find bays or gulfs at the extremities of the Currents of the Ocean; but, on the contrary, islands. At the extremity of the great Current of the Indian Ocean is placed the Island of Madagascar, which protects Africa against it's violence. The islands of the Terra-del-Fuego defend in like manner the southern extremity of America, at the confluence of the eastern and western Currents of the South Seas. The numerous archipelagos of the Indian Ocean and of the South

Sea are situated about the Line, where the two general Currents of the North and South Seas meet.

With Islands too it is that Nature protects the inlets of bays and mediterraneans. Great Britain and Ireland cover that of the Baltic; the islands of Welcome and Good-fortune cover Hudson's-Bay; the island of St. Lawrence protects the entrance of the gulf which bears that name; the chain of the Antilles, the gulf of Mexico; the isles of Japan, the double gulf formed by the peninsula of Gorée with the country adjacent. All currents bear upon islands. Most of these are for this reason noted from their prodigious swells, and their gusts of wind; such are the Azores, the Bermudas, the island of Tristan, of Acunhah, and others. Not that they contain within themselves the causes of such phenomena, but from their being placed in the focuses of the revolutions of the Ocean, and even of the Atmosphere, for the purpose of weakening their effects. They are in positions nearly similar to those of Capes, which are all celebrated for the violent tempests which beat upon them: as Cape Finisterre, at the extremity of Europe; the Cape of Good Hope, at that of Africa; and Cape Horn, at that of America. Hence comes the sea proverb to *double the Cape*, to express the surmounting of some great difficulty. The Ocean accordingly, instead of bearing upon the retiring parts of the Continent, sets in upon those which are most prominent; and it must speedily have destroyed these had not Nature fortified them in a most wonderful manner.

The western coast of Africa is defended by a long bank of sand, on which the billows of the Atlantic Ocean are continually breaking. Brasil, in the whole extent of it's shores, opposes to the winds which blow continually from the East, and to the Currents of the Sea, a prodigious rampart of rocks, more than a thousand leagues long, twenty paces broad at the summit, and of an unknown thickness at the base. It is a musket-shot distant from the beach. It is entirely covered at high-water, and on the retreating of the tide, it exhibits the elevation of a peak. This enormous dike is composed of one solid mass lengthwise, as has been ascertained by repeated borings; and it would be impossible for a vessel to get into Brasil, were it not for the several inlets which Nature has formed.*

* See History of the Troubles of Brasil, by Peter Moreau.

Go from South to North, and you find similar precautions employed. The coast of Norway is provided with a bulwark nearly resembling that of Brasil. *Pont Oppidan* tells us that this coast, which is nearly three hundred leagues in length, is for the most part steep, angular, and pendant; so that the Sea in many places presents a depth of no less than three hundred fathoms close in-shore. This has not prevented Nature from protecting these coasts by a multitude of isles, great and small. "By such a rampart," says that Author, "consisting of perhaps "a million or more of massy stone pillars, founded in the very "depth of the Sea, the chapiters of which rise only a few fathoms above the surface, all Norway is defended to the West, "equally against the enemy and against the Ocean." There are, however, some coast harbours behind this species of sea-bulwark, of a construction so wonderful. But as there is frequently great danger, adds he, of ships being driven ashore before they can get into port, from the winds and currents which are very violent in the straits of these rocks and isles, and from the difficulty of anchoring in such a vast depth of water, Government has been at the expense of fastening several hundreds of strong iron rings in the rock, more than two fathoms above water, by which vessels may be safely moored.

Nature has infinitely varied these means of protection, especially in the islands themselves which protect the Continent. She has, for example, surrounded the Isle of France with a bank of madrépores, which opens only at the places where the rivers of that island empty themselves into the Sea. Other islands, several of the Antilles in particular, were defended by forests of mangliers which grow in the sea-water, and break the violence of the waves, by yielding to their motion. To the destruction perhaps of these vegetable fortifications, we ought to ascribe the irruptions of the Sea, now so frequent in several islands, particularly that of Formosa. There are others which consist of pure rock, rising out of the bosom of the waves, like huge moles; such is the Maritimo, in the Mediterranean. Others are volcanic, as the Isle of Fuego, one of the Cape de Verd islands, and several others of the same description in the South Sea, which rise like pyramids with fiery summits, and answer the purpose of light-houses to mariners, by their flame in the night-time, and their smoke by day.

The Maldivia islands are defended against the Ocean by precautions the most astonishing. In truth, they are more exposed than many others, being situated in the very midst of that great Current of the Indian Ocean of which mention has been already made, and which passes and repasses them twice a year. They are besides so low, as hardly to rise above the level of the water; and they are so small, and so numerous, that they have been computed at twelve thousand, and several are so near to each other, that it is possible to leap over the channel which divides them. Nature has first collected them into clusters, or archipelagos, separated from each other by deep channels which go from East to West, and which present various passages to the general Current of the Indian Ocean. These clusters are thirteen in number, and extend in a row from the eighth degree of northern to the fourth degree of southern Latitude, which gives them a length of three hundred of our leagues of 25 to a degree.

But let us permit the interesting and unfortunate *Francis Pyrard*, who there passed the flower of his days in a state of slavery, to describe the architecture of them; for he has left us the best description which we have of those islands, as if it were necessary that in every case things the most worthy of the esteem of Mankind should be the fruit of some calamity. "It is wonderful," says he, "to behold each of these clusters encompassed round and round with a great bulwark of stone, such as no human art can pretend to equal in securing a spot of ground within walls.* These clusters are all roundish or oval, and are about thirty leagues each in circumference, some a very little more, others a very little less, and are all in a series, and end to end, without any contact whatever. There are between every two channels of the Sea, some broad, others very narrow. When you are in the centre of a cluster, you see all around that great bulwark of stone, which as I have said encompasses it, and defends the isles against the impetuosity of the Ocean. But it is truly frightful, even to the boldest, to approach this bulwark, and to behold the billows coming from afar, ready to burst with fury on every side: for then, I assure you, as a thing I have seen a thousand

* Voyage to the Maldivias, chap. x

“and a thousand times, the perturbation or bubbling over exceeds the size of a house, and it is whiter than a fleece of cotton: so that you seem surrounded with a wall of brilliant whiteness, especially when Ocean is in his majesty.”

Pyrard farther observes, that most of the isles, inclosed in these subdivisions, are surrounded each in particular by a particular bank, which farther defends them against the Sea. But the Current of the Indian Ocean, which passes through the parallel channels of these clusters of islands, is so violent, that it would be impossible for Mankind to keep up a communication between one and another, had not Nature arranged all this in her own wonderful manner. She has divided each of these clusters by two particular channels, which intersect them diagonally, and whose extremities exactly terminate at the extremities of the great parallel channels which separate them. So that if you wish to pass from one of these archipelagos to another, when the current is easterly, you take your departure from that where you happen to be, by the diagonal canal of the East, where the water is calm, and committing yourself afterward to the current which passes through the parallel channel, you proceed in a deflecting course to land on the opposite cluster, into which you enter by the opening of it's diagonal channel, which is to the West. The mode of proceeding is reversed, when the current changes six months afterwards. Through these interior communications the islanders at all seasons can make excursions from isle to isle, the whole length of the chain from North to South, notwithstanding the violence of the currents which separate them.

Every isle has it's proper fortification, proportioned, if I may say so, to the danger to which it is exposed from the billows of the Ocean. It is not necessary to suppose the water roused into a tempest, in order to form an idea of their fury. The simple action of the trade-winds, however uniform, is sufficient to give them unremittingly the most violent impulsion. Each of these billows joining to the constant velocity impressed upon it every instant by the wind an acquired velocity from it's particular movement would form, after running through a considerable space, an enormous mass of water, were not it's course retarded by the currents which cross it, by the calms which slacken it,

but above all, by the banks, the shallows, and the islands which break it.

A very perceptible effect of this accelerated velocity of the waves is visible on the coasts of Chili and Peru, which undergo, however, only the simple concussion and repercussion of the waters of the South-Sea. The shores are inaccessible through their whole extent, unless at the bottom of some bay, or under the shelter of some island situated near the coast. All the islands of that vast ocean, so peaceful as to have obtained the distinctive appellation of Pacific, are unapproachable on the side which is exposed to the Currents occasioned by the Trade-winds only, unless where shelves or rocks break the impetuosity of the billows. In that case, it is a spectacle at once magnificent and tremendous, to behold the vast fleeces of foam which incessantly rise from the bosom of their dark and rugged windings; and to hear their hoarse roaring noise, especially in the night-time, carried by the winds to several leagues distance.

Islands then are not fragments separated by violence from the Continents. Their position in the Ocean, the manner in which they are defended, and the length of their duration, constitute a complete demonstration of this. Considering how long the Sea has been battering them with it's utmost fury, they must have been by this time reduced to a state of total ruin. Scylla and Carybdis, nevertheless, emit to this day their ancient roarings, so as to be heard at the extremities of Sicily.

This is not the proper place to indicate the means which Nature employs to preserve the islands, and to repair them; nor to adduce the other proofs from the vegetable and animal kingdoms, and from Man, which evince that they have existed, such as we now see them, from the very origin of the Globe: it will be sufficient for me to give an idea of their construction, in order to produce perfect conviction in every candid mind that they are in no one respect the work of chance. They contain as Continents themselves do, mountains, peaks, rivers and lakes, proportioned to their magnitude. For the purpose of demonstrating this new truth, I shall be still under the necessity of saying somewhat respecting the distribution of the Globe; but I shall not be long, and shall endeavour to introduce nothing but what is absolutely needful to make myself understood.

It is first to be remarked, that the chains of mountains in both Continents, are parallel to the Seas which wash their coasts : so that if you see the plan of one of those chains with it's different branches, you are able to determine the shore of the Sea which corresponds to them ; for, as I have just said, the mountains and these are always parallel. You may in like manner, on seeing the sinuosities of a shore, determine those of the chains of mountains which are in the interior of a country ; for the gulfs of a Sea always correspond to the valleys of the mountains of the lateral Continent.

These correspondencies are perceptible in the two great chains of the Old and of the New Worlds. The long chain of Taurus runs East and West, as does the Indian Ocean, the different gulfs of which it incloses by branches prolonged as far as to the extremities of most of their Capes. On the contrary, the chain of the Andes in America runs North and South, like the Atlantic Ocean. There is besides another thing worthy of remark, nay, I venture to say, of admiration, it is that these chains of mountains are opposed to the regular winds which cross those Seas, and which convey the emanations from them ; and that their elevation is proportioned to the distance at which they are placed from such shores : so that the farther they are removed from the Sea, the greater is their elevation into the Atmosphere.

For this reason it is that the chain of the Andes is placed along the South Sea, where it receives the emanations of the Atlantic Ocean, wafted by the East wind over the vast Continent of America. The broader that Continent becomes, the greater is the elevation of that chain. Toward the isthmus of Panama, where the Continent has no great breadth, and consequently the distance from the Sea is small, the elevation of the mountains is inconsiderable : but they suddenly rise, precisely in proportion as the American Continent widens. It's highest mountains look over the broadest expansion of America, and are situated in the Latitude of Cape St. Augustin.

The situation and the elevation of this chain were equally necessary to the fertility of this grand division of the New World. For if this chain, instead of extending lengthwise by the coast of the South Sea, had extended along the coasts of Brasil, it would have intercepted all the vapours conveyed over

the Continent by the East wind ; and if it were not elevated to a region of the Atmosphere, to which no vapour could ascend, because of the subtilty of the air, and of the intenseness of the cold, all the clouds borne by the East wind would be carried beyond it into the South Sea. On either of these two suppositions, most of the rivers of South America would be dried up.

The same reasoning may be applied to the chain of Taurus. It presents to the Northern and Indian Oceans a double ridge, with opposite aspects, from which flow most of the rivers of the ancient Continent, some to the North and others to the South. It's branches are disposed in like manner : they do not coast along the peninsulas of India, by their shores ; but cross them through the middle at their full length ; for the winds of those Seas do not blow always from one and the same quarter, as the East wind in the Atlantic Ocean ; but six months in one direction, and six months in another. It was proper accordingly to divide to them the land which they were intended to water.

It remains that I subjoin some farther observations respecting the configuration of those mountains, to confirm the use to which they are destined by Nature. They are crowned from distance to distance by long peaks similar to lofty pyramids. These peaks, as has been well observed, are of granite, at least most of them. I do not know the component parts of granite ; but I know well that these peaks attract the vapours of the Atmosphere, and fix them around in such a quantity, that they themselves frequently disappear. This is a remark which I have made times without number, with respect to the peak of Piterboth, in the Isle of France, where I have seen the clouds driving before the South-east wind, turn aside perceptibly from their direction, and gather round it, so as sometimes to form a very thick cap, which rendered the summit totally invisible.

I had the curiosity to examine the nature of the rock of which it is composed. Instead of being formed of grains, it is full of small holes, like the other rocks of the island ; it melts in the fire, and when melted, you may perceive on it's surface small grains of copper. It is impossible to doubt that it must be impregnated with that metal ; and to the copper we must perhaps ascribe the virtue which it possesses of attracting the clouds. For it is known by experience that this metal, as well as iron, has the property of attracting thunder. I do not know

of what materials other peaks are composed ; but it is remarkable, that at the summit of the Andes, and on their ridges, are found the gold and silver mines of Chili and Peru, and that in general all mines of iron and copper are found at the source of rivers, and in elevated situations, where they discover themselves by the fogs which surround them. Whatever may be in this, whether this attractive quality be common to granite, and to rocks of a different nature, or whether it depends on some metal which is amalgamated with them, I consider all the peaks in the world as real electric needles.

But it was not sufficient that clouds should collect and fix on the tops of mountains, the rivers which have their sources there could have only an intermittent course. As soon as the rainy season was at an end, the rivers must have ceased to flow. Nature, in order to remedy this inconveniency, has contrived, in the vicinity of their peaks, lakes, which are real reservoirs, or cisterns of water, to furnish a regular and constant supply to their expenditure. Most of those lakes are of an incredible depth ; they answer several other purposes, such as that of receiving the melted snows of the mountains, which would otherwise flow with too great rapidity. When they are once full, it requires a very considerable time to exhaust them. They exist, either internally or externally, at the source of all regular currents of water ; but when they are external, they are proportioned, either by their extent, or by their depth and their discharges, to the size of the river which they are designed to emit, as well as the peaks which are in the vicinity. These correspondencies must have undoubtedly been known to antiquity ; for I think I have seen some very ancient medals, in which rivers were represented by figures leaning on an urn, and stretched along at the basis of a pyramid ; which was probably designed to denote at once their source and their discharge.

If then we come to apply these general dispositions of Nature to the particular conformation of islands, we shall see that they have, like Continents, mountains with branches parallel to their bays ; that these mountains are of an elevation corresponding to their distance from the Sea ; and that they contain peaks, lakes, and rivers, proportional to the extent of their territory. Like Continents too they have their mountains, disposed in a suitability to the winds which blow over the Seas whereby they

are surrounded. Those which are in the Indian Ocean, as the Moluccas, have their mountains toward the centre ; so as to receive the alternate influence of the two atmospheric Monsoons. Those, on the contrary, which are under the regular influence of the East winds, in the Atlantic Ocean, as the Antilles, have their mountains thrown to the extremity of the island which is under the wind, precisely as the Andes with respect to South America. The part of the island that is toward the wind is, in the Antilles, called *cabsterre*, as who should say *caput terræ* (the head of the land) ; and that which is from the wind *basseterre* (low land) ; though, for the most part, says Father *du Terre*,* this last is higher and more mountainous than the other.

The island of Juan Fernandez, which is in the South Sea, but very far beyond the Tropics, being in 33 deg. 40 min. of South Latitude, has it's northern part formed of rocks very lofty and very steep, and it's South side flat and low, to receive the influences of the South wind, which blows there almost all the year round. The description of it is to be found in *Anson's Voyage round the World*.

The islands which deviate from these dispositions, and which are but few in number, have remote relations still more wonderful, and certainly well worthy of being studied. They furnish besides in their vegetable and animal productions, other proofs that they are small Continents in miniature. But this is not the place to bring them forward. If they were, as is pretended, the remains of a great continent swallowed up by the Ocean, they would have preserved part at least of their ancient and vast fabric. We should see arise immediately out of the middle of the Sea lofty peaks, like those of the Andes, from twelve to fifteen hundred fathom high, without the mountains which support them. In other places, we should see these peaks supported by enormous mountains, proportioned to their magnitude, and which should contain in their cavities great lakes, like that of Geneva, with rivers issuing from them, such as the Rhone, and precipitating themselves at once into the Sea, without watering any land. There should be at the bottom of their majestic protuberances no plains, nor provinces, nor kingdoms.

* Natural History of the Antilles, p. 12.

These grand ruins of the Continent, in the midst of the Ocean, would have some resemblance to those enormous pyramids reared in the sands of Egypt, which present to the eye of the traveller only so many frivolous and unmeaning structures ; or to those vast royal palaces which the hand of time has demolished, of which you perceive turrets, columns, triumphal arches ; but the habitable parts of which are entirely destroyed. The sage productions of Nature are not useless and transitory, like the works of Men. Every Island has it's champaign country, it's valleys, it's hills, it's hydraulic pyramids, and it's Naiads, in proportion to it's extent.

Some islands, it is true, but they are very few, contain mountains more elevated than the extent of their territory may seem to require. Such is that of Teneriff : it's peak is so high, as to be covered with ice a great part of the year. But that island contains mountains of no great elevation, which are proportioned to it's bays : that of the mountains which support the peak, swells up amidst the others in form of a dome, not unlike the dome of the Invalids rising above the adjacent buildings. I myself observed it with particular attention, and made a drawing of it on my way to the Isle of France. The lower mountains are an appertenance to the island, and the peak to Africa.

This peak, covered with ice, is situated directly opposite to the entrance of the great sandy desert, called Zara, and contributes undoubtedly to refresh the shores and Atmosphere of it, by the effusion of it's snows, which takes place in the midst of Summer. Nature has placed other glaciers besides at the entrance of this burning desert, such as Mount Atlas. Mount Ida, in the island of Crete, with it's collateral mountains, covered at all seasons with snow, is situated, according to the observation of *Tournefort*, precisely opposite to the burning desert of Barca, which coasts along Egypt from North to South. These observations will furnish a farther opportunity of making some reflections on the chains of icy mountains, and of the Zones of sand scattered over the Globe.

I ought to beg forgiveness of the Reader for these digressions, into which I have been insensibly drawn ; but I will render them as short as I possibly can, though by abridging them their clearness is considerably diminished.

The icy mountains appear to be principally designed to convey coolness to the shores of the Seas situated between the tropics; and the Zones of sand, on the contrary, to accelerate by their heat the fusion of the polar ices. We can indicate, only in a cursory manner, those most wonderful harmonies; but it is sufficient to peruse the journals of Navigators, and to study geographical charts, to be convinced that the principal part of the Continent of Africa is situated in such a manner, that it is the wind of the North Pole which blows most constantly on it's coasts; and that the shore of South America projects beyond the Line, so as to be cooled by the wind of the South Pole. The Trade-winds, which prevail in the Atlantic Ocean, always participate of the influence of both Poles; that which is on our side draws considerably toward the North; and that which is beyond the Line depends greatly on the South Pole. These two winds are not oriental, as has been erroneously imagined, but they blow nearly in the directions of the channel which separates America from Africa.

The warm winds of the torrid Zone, blow, in their turn, the most constantly toward the Poles; and it is singularly remarkable, that as Nature has placed icy mountains in it's vicinity to cool its Seas, conjointly with those of the Poles, as Taurus, Atlas, the Peak of Teneriff, Mount Ida, and others; she has likewise extended a long Zone of sand, in order to increase the heat of the South wind on it's way to warm the Seas of the North. This Zone commences beyond Mount Atlas, and encompasses the Earth like a Belt, extending from the most westerly point of Africa to the most easterly extremity of Asia, in a reduced distance of more than three thousand leagues. Some branches of it deviate from the general direction, and advance directly toward the North.

We have already remarked that a region all sand is so hot even in our Climates, from the multiplied reflection of it's brilliant particles, that we never find the snow covering it for any considerable time together, even in the middle of our severest Winters. Those who have crossed the sands of Estampes in Summer, and in the heat of the day, know well to what a violent degree the heat is there reverberated. It is so ardent certain days in Summer, that about twenty years ago four or five pavilions, who were at work on the great road leading to that City

between two banks of white sand, were suffocated by it. Hence it may be concluded from facts so obvious, that but for the ices of the Pole, and of the mountains in the vicinity of the torrid Zone, a very considerable portion of Africa and Asia would be absolutely uninhabitable, and that but for the sands of Africa and Asia, the ices of our Pole would never melt.

Every icy mountain, too, has, like the Poles, its sandy girdle, which accelerates the fusion of its snows. This we have occasion to remark, in the description of all mountains of this species, as of the Peak of Teneriff, of Mount Ararat, of the Cordeliers, and the like. These Zones of sand surround not only their bases, but there are some of them on the higher regions of the mountains, up to the very peaks; it frequently requires several hours walking to get across them.

The sandy belts have a still farther use, that of contributing to the repair of the waste, which the territory of the mountain from time to time undergoes: perpetual clouds of dust issue from them, which rise in the first instance on the shores of the Sea, where the Ocean forms the first deposits of these sands, which are there reduced to an impalpable powder by the incessant dashing of the waves upon them; we afterwards find these clouds of dust in the vicinity of lofty mountains. The conveyance of the sands is made from the shores of the Sea into the interior of the Continent at different seasons, and in various manners. The most considerable happens at the Equinoxes, for then the Winds blow from the Sea into the Land. See what *Corneille le Bruyn* says of a sandy tempest, in which he was caught on the shore of the Caspian Sea. These periodical conveyances of the sand form a part of the general revolutions of the Seas. But as to the interior of different countries, partial transits take place every day, which are very perceptible toward the more elevated regions of the Continents.

All travellers who have been at Pekin are agreed, that it is not possible to go abroad during a part of the year into the streets of that City without having the face covered with a veil, on account of the sand with which the air is loaded.

When *Isbrand-Ides* arrived on the frontiers of China, at the extremity of the outlet of the mountains in the neighbourhood of Xaixigar, that is, at that part of the crest of the Asiatic Continent which is the most elevated, from which the rivers begin

their courses, some to the North, others to the South, he observed a regular period of these emanations. "Every day," says he,* "at noon regularly, there blows a strong gust of wind for two hours together, which, joined to the sultry heat of the Sun by day, parches the ground to such a degree, that it raises a dust almost insupportable. I had observed this change in the air some time before. About five miles above Xaixigar, I had perceived the Heavens cloudy over the whole extent of the mountains; and when I was on the point of leaving them, I saw perfect serenity. I even remarked at the place where they terminate an arch of clouds, which swepted from West to East, as far as the mountains of Albaze, and which seemed to form a separation of climate." Mountains accordingly possess at once nebulous and fossil attractions. The first furnish water to the sources of the rivers which issue from them, and the second supply them with sand, for keeping up their territory and their minerals.

The icy and sandy Zones are found in a different harmony on the Continent of the New World. They run, like it's Seas, from North to South, whereas those of the Old Continent are directed, conformably to the lengthwise direction of the Indian Ocean, from West to East.

It is very remarkable that the influence of icy mountains extends farther over the Ocean than over the Land. We have seen those of the two Poles take the direction of the channel of the Atlantic Ocean. The snows which cover the long chain of the Andes in America, serve in like manner to cool the whole of the South Sea, by the action of the East-wind which passes over it; but as part of that Sea, and of it's shores, which is sheltered from this wind by the very height of the Andes, would have been exposed to an excessive heat, Nature has formed an elbow westward at the most southerly part of America, which is covered with icy mountains, so that the fresh breezes which perpetually issue from them may graze along the shores of Chili and Peru. These breezes, denominated the southerly, prevail there all the year round, if we may believe the testimony of every Navigator. They do not in truth come from the South Pole: for if it were so, no vessel could ever double Cape Horn;

* Journey from Moscow to China, chap. xi.

but they come from the extremity of Magellan's Land, which is evidently bent backward, with relation to the shores of the South Sea.

The ices of the Poles then renovate the waters of the Sea, as the ices of mountains renovate those of the great rivers. These effusions of the polar ices press toward the Line, from the action of the Sun, who is incessantly pumping up the waters of the Sea in the torrid Zone, and determines, by this diminution of bulk, the waters of the Poles to rush thitherward. This is the first cause of the motion of the South Seas, as has been already observed. It would appear highly probable, that the polar effusions are proportioned to the evaporations of the Ocean. But without losing sight of the leading object of our enquiry, we shall examine for what reason Nature has taken still greater care to cool the Seas, than the Land of the torrid Zone: for it merits attention, that not only the polar Winds which blow there, but most of the rivers which empty themselves into the South Seas, have their sources in icy mountains, such as the Zara, the Amazon, the Oroonoko, and others.

The Sea was destined to receive, by means of the rivers, all the spoils of vegetable and animal productions over the whole Earth; and as it's course is determined toward the Line, by the daily diminution of it's waters which the Sun is there continually evaporating, it's shores within the torrid Zone would have been quickly liable to putrefaction, had not Nature employed these different methods to keep them cool. It is for this reason, as certain Philosophers allege, that the Sea is salt between the Tropics. But it is likewise so to the North; nay, more so, if we may rely on the recent experiments of the interesting *M. De Pagès*. It is the saltiest, and the heaviest in the World, according to the testimony of an English Navigator, Captain *Wood*, who wrote in 1676.

Besides the saltness of the Sea does not preserve it's waters from corruption, as is vulgarly believed. All who have been at Sea know well, that if a bottle or a cask is filled in hot climates with sea-water, it soon becomes putrid. Sea-water is not a pickle; it is, on the contrary, a real lixivial, which very quickly dissolves dead bodies. Though salt to the taste, it takes out salt sooner than fresh water, as our common sailors know from daily experience, for they employ no other in freshening their

salt provisions. It blanches on the shore the bones of all animals, as well as the madrépores, which when in a state of life are brown, red, and of various other colours, but which being rooted up and put into sea-water on the brink of the shore, in a little time become as white as snow. Nay more, if you fish in the sea for a crab, or a sea-urchin, and have them dried to preserve them, unless you first wash them in fresh water, all the claws of the crab, and all the prickles of the urchin, will fall off. The joints by which the limbs are attached, dissolve in proportion as the sea-water with which they were moistened evaporates. I myself have made this experiment to my cost. The water of the Sea is impregnated not only with salt, but with bitumen, and other substances besides, which we do not know; but salt is in it in such a proportion, as to assist the dissolution of cadaverous bodies floating in it, as that which we mingle with our food assists digestion. Had nature made it a pickle, the Ocean would be covered with all the impurities of the Earth, which would thus be kept in a state of perpetual preservation.

These observations would indicate to us the use of volcanos. They do not proceed from the internal fires of the Earth, but they derive their origin and materials which keep them up from the waters. In order to be convinced of this, you have only to remark that there is not a single volcano in the interior of Continents, unless it be in the vicinity of some great lake, such as that of Mexico. They are situated for the most part in islands, at the extremity or at the confluence of the Currents of the Sea, and in the counter-tides of their waters. This is the reason why we find them in such numbers toward the Line, and along the shore of the South Sea, where the South-wind, which perpetually blows there, brings back all the substances swimming about in a state of dissolution.

Another proof that they owe their support to the Sea is this, that in their eruptions they frequently vomit out torrents of salt water. *Newton* ascribed their origin and their duration to caverns of sulphur inclosed in the bowels of the Earth. But that great man had not reflected on the position of volcanos in the vicinity of water, nor calculated the prodigious quantity of sulphur which the magnitude and the duration of their fires must have required. *Vesuvius* alone, which burns night and day from time immemorial, would have consumed a mass of it

larger than the whole kingdom of Naples. Besides, Nature does nothing in vain. What purpose could be answered by such magazines of sulphur in the interior of the Earth? We should find them completely entire in the places where they are not consumed by the fire. Mines of sulphur are no where found but in the vicinity of volcanos. What besides could renovate them when exhausted? A supply so constant for keeping up volcanos is not in the Earth, but in the Sea. It is furnished by the oils, the bitumens, and the nitres of vegetables and animals, which the rains and the rivers convey off from every quarter into the Ocean, where the dissolution of all bodies is completed by it's lixivial water. To these are joined metallic dissolutions, and especially those of iron, which, as is well known, abounds all over the earth. Volcanos take fire, and feed themselves with all these substances.

Lemery, the Chymist, has imitated their effects, by a composition consisting of filings of iron, sulphur, and nitre, moistened with water, which caught fire of itself. If Nature had not kindled these vast furnaces on the shores of the Ocean, it's waters would be covered with vegetable and animal oils, which would never evaporate, for they resist the action of the air. You may have frequently observed them, when stagnated in some undisturbed bason, from their colour resembling the pigeon's neck. Nature purifies the waters by the fire of volcanos, as she purifies the air by those of thunder; and as storms are more common in hot countries, she has in these likewise multiplied volcanos, and for the same reason. She burns on the shores the impurities of the Sea, as a Gardener burns at the end of Autumn the refuse of his garden.

We find lavas indeed in the interior of countries; but a proof that they are indebted to the water for their original is this, that the volcanos which produced them became extinct whenever the waters failed them. These volcanos were kindled, like those which still subsist, by vegetable and animal fermentations with which the Earth was covered after the Deluge, when the spoils of so many forests, and of so many animals, whose trunks and bones are still found in our quarries, floated on the surface of the Ocean, and formed prodigious deposits, when the currents accumulated in the cavities of the mountains. It cannot be doubted that in this state they caught fire by the effect of fer-

mentation merely, just as we see stacks of damp hay catch fire in our meadows. It is impossible to call in question these ancient conflagrations, the traditions of which are preserved in Antiquity, and which immediately follow those of the Deluge. In the ancient Mythology, the history of the serpent Python, produced by the corruption of the waters, and that of Phaeton, who set the world on fire, immediately follow the history of Philemon and Baucis,* escaped from the waters of the Deluge, and are allegories of the pestilence, and of the volcanos, which were the first results of the general dissolution of animals and vegetables.

All that now remains is to refute the opinion of those who maintain that the Earth is a secretion from the Sun. The chief arguments by which they support it are it's volcanos, it's granites, the vitrified stones scattered over it's surface, and it's progressive refrigeration from year to year. I respect the celebrated Author who has advanced this opinion, but I venture to affirm, that the grandeur of the images which this idea presented to him has seduced his imagination.

We have said enough respecting volcanos, to demonstrate that they do not proceed from the interior of the Earth. As to granites, they do not present, in the aggregation of their grains, the remotest vestige of the action of fire. I do not know their origin; but certainly there is no foundation for referring it to that element, because it cannot be ascribed to the action of water, and because shells are not found in them. As this assertion is destitute of all proof, it is unnecessary to undertake a refutation of it. I shall observe, however, that granites do not appear to be the production of fire, on a comparison with the lavas of volcanos; the difference of their substances supposes different causes in their formation.

Agates, flints, and every species of the silix, seem to be analogous to vitrifications, from their half-transparency, and from their being usually found in beds of marle, which resemble banks of lime extinguished; but these substances are not the productions of fire, for lavas never present any thing similar. I have picked up on the flinty hills of Lower Normandy oyster-shells perfectly complete, amalgamated with black flints, which

* The Author undoubtedly means Deucalion and Pyrrha

they call *bisets*. Had these bisets been vitrified by fire, they would have calcined, or at least altered the oyster-shells which adhered to them; but these were as sound as if just taken out of the water. The shelving sea-coast along the district of Caux are formed of alternate strata of marle and bisets, so that as they are not cut perpendicularly, you would call it a great wall, of which the layers had been regulated by an Architect; and with so much the greater appearance of probability, that the people of the country build their houses of the same materials, disposed in the self-same order.

These banks of marle are from one to two feet broad, and the rows of flints which separate them are three or four inches thick. I have reckoned seventy or eighty of such horizontal strata from the level of the Sea up to that of the Land. The thickest are undermost, and the smaller a-top, which from the sea-mark makes the aggregate appear higher than it really is; as if Nature intended to employ a certain degree of perspective to increase the apparent elevation: but undoubtedly she has been determined to adopt this arrangement from reasons of solidity, which are perceptible in all her Works. Now these banks of marle and flint are filled with shells, which have undergone no alteration from the force of fire, and which would be in perfect preservation, had not the pressure of that enormous mass broken in pieces the largest of them. I have seen fragments extracted of that which is called the *thuilée*, which is found alive only in the Indian Ocean, and the broken pieces of which when put together formed a shell much more considerable than those of the same species, which are used for holding the holy water in the church of Saint-Sulpice at Paris.

I have likewise remarked there a bed of flints completely amalgamated, and forming a single table, the section of which was perceptibly about one inch thick by more than thirty feet in length. It's depth in the cliff I did not ascertain; but with a little art it might be detached and fashioned into the most superb agate table in the world. Wherever these marles and flints are found, shells are likewise found in great quantities, so that as marle has been evidently formed of their wreck, it appears to me extremely probable that the flints have been composed of the very substance of the fishes which were there inclosed.

This opinion will appear less extraordinary, if we observe that many of the *cornes d'ammon*, and of single-shelled fossils, which from their form have resisted the pressure of the ground, and not being compressed by it, have not ejected, like the double-shelled, the animal matter which they contained, but exhibit it within them under the form of crystals, with which they are usually filled, whereas the two-shelled are totally destitute of it.

The animal substances of these last, I presume, confounded with their crushed fragments, have formed the different coloured pastes of marble, and have communicated to them the hardness and polish of which these marbles are susceptible. This substance presents itself even in shell-fish when alive, with the characters of agate, as may be seen in several kinds of mother-of-pearl, and among others, in the half transparent, and very hard knob, which terminates what is called the *harpe*. Finally, this stony substance is found besides in land animals; for I have seen in Silesia the eggs of a species of the woodcock, which are highly prized in that country, not only because they are a great delicacy for the table, but because the white when dried becomes hard as a flint, and susceptible of a polish so beautiful, that they are cut and set as rings and other trinkets.

I could easily swell this article, by demonstrating the geometrical impossibility that our Globe should have been detached from that of the Sun by the transit of a Comet, because it must have, on the very hypothesis of this impulsion, been hurried along in the sphere of the Comet's attraction, or carried back into that of the Sun. It has in truth remained in the sphere of the Sun's attraction; but it is not easy to conceive how it never came to approach nearer, and how it comes to maintain the distance of nearly thirty-two millions of leagues, while no Comet prevents it's returning to the place from which it set out. The Sun, it is said, has a centrifugal force. The Globe of the Earth, therefore, must be retiring from it. No, it is alleged, because the Earth has a constant tendency toward that Luminary. It must accordingly have lost the centrifugal force, which should adhere to it's very nature, as being a portion of the Sun.

I could go on to swell the article, by farther demonstrating the physical impossibility that the Earth should contain, in it's bowels so many heterogeneous substances, on the supposition of it's being a separation from a body so homogeneous as the Sun:

and I could make it appear that it is impossible they should be in any respect considered as the wreck of solar and vitrified substances (if it be possible for us to have an idea of the substances from which light issues), seeing some of our terrestrial Elements, such as Water and Fire, are absolutely incompatible. But I shall confine myself to the refrigeration ascribed to the Earth, because the evidence on which this opinion rests is level to the comprehension of all men, and is of importance to their security.

If the Earth is getting colder and colder, the Sun, from which it is said to have been separated, must be getting cold in proportion; and the mutual diminution of the heat in these two Globes must become perceptible in a course of ages, at least on the surface of the Earth, in the evaporations of the Seas, in the diminution of rains, and especially in the successive destruction of a great number of plants, which are killed every day merely from the diminution of only a few degrees of heat, when the Climate is changed upon them. Not a single plant, however, has been lost of all those which were known to Circé, the most ancient of Botanists, whose herbal Homer has in some measure preserved for us. The plants celebrated in song by Orpheus, and their virtues, subsist to this day. There is not even a single one which has lost any thing of it's ancient attitude. The jealous Clytia still turns towards the Sun; and the beautiful son of Liriope, Narcissus, continues to admire himself on the brink of the fountain.*

Such are the testimonies adduced from the vegetable kingdom, respecting the uniformity and constancy of the tempera-

* If I understand our author, he means to assert, that every species of plant once created, still exists. This I cannot believe; on the contrary, I think it sufficiently evident, that *many* species of plants have been entirely lost. Who will venture to doubt this, when he sees impressed upon slate, free-stone, &c., the images, nay sometimes even portions of the ligneous substance, of plants, the living representatives of which are no longer to be found? What is there to prevent the total annihilation of some of those species of vegetables, which are confined, and sometimes in small quantity, to very narrow districts of particular countries? The botanists of a future age, may look in vain, for the marjoram of the Greek Amorgos, for the delicate little talinum of Pennsylvania and Virginia, and even perhaps, for the wonderful dionaea, of Carolina. It is easy to see, in many instances, in what manner certain species of plants may become extinct.—B. S. B.

ture of the Globe ; let us examine those of the Human Race. There are some of the inhabitants of Switzerland, it is alleged, who have perceived a progressive accumulation of the ices on their mountains. I could oppose to this evidence that of other modern Observers, who, in the view of ingratiating themselves with the Princes of the North, pretend, with as little foundation, that the cold is diminishing there, because these Princes have thought proper to cut down the forests of their States ; but I shall adhere to the testimony of the Ancients, who could not possibly intend to flatter any one on a subject of this nature.

If the refrigeration of the Earth is perceptible in the life of one man, it must be much more so in the life of Mankind : now all the temperatures described by the most ancient Historians, as that of Germany by Tacitus, of Gaul by Cesar, of Greece by Plutarch, of Thrace by Xenophon, are precisely the same at this day, as they were at the time when those several Historians wrote. The Book of Job the Arabian, which there is reason to believe is more ancient than the Writings of Moses,* and which contains views of Nature much more profound than is generally imagined, views, the most common whereof were unknown to us two centuries ago, makes frequent mention of the falling of the snows in that country, that is, toward the thirtieth degree of North Latitude. Mount Lebanon, from the remotest antiquity, bears the Arabian name of *Liban*, which signifies white, on account of the snows with which it's summit

* It is the opinion of several writers of much learning, that the Book of Job was wholly written by Moses. But this hypothesis has been ably opposed by the President Goguet, in a *dissertation upon the authenticity and antiquity* of this book. Goguet supposes that Job was cotemporary with Jacob ; that the book, “ as we have it at present,” is “ in part an original work, and in part a translation ;” and that the narration or historical part of the work was written by Moses. In this part, says our learned author, “ we do not find one word that is not pure Hebrew. The style of it is perfectly similar to that of the Pentateuch ; no body can maintain the contrary, without exposing himself to the charge of prevarication, or of ignorance in the Hebrew language.” “ As to the rest of the book of Job, such as we have it, Moses (says the President) being only the translator, it is not at all surprising, that we find some words in it taken from the Syriac and Chaldee.” The whole of the dissertation is well worthy of perusal. It is annexed to the first volume of Goguet's excellent work, entitled “ *The Origin of Laws, Arts, and Sciences, and their Progress among the most ancient nations.*” English translation. Edinburgh : 1775.—B. S. B.

is covered all the year round. Homer relates that it snowed in Ithaca when Ulysses arrived there, which obliged him to borrow a cloak of the good Eumeus.

If, during a period of three thousand years and more, the cold had gone on increasing from year to year in all these Climates, their Winters must now have been as long and as severe as in Greenland. But Lebanon, and the lofty provinces of Asia, have preserved the same temperature. The little Isle of Ithaca is still covered in Winter with the hoar frost; and it produces, as in the days of Telemachus, the laurel and the olive.*

* I feel much inclined to adopt the opinions of Saint-Pierre in this part of his work, notwithstanding they are opposed by the learning and ingenuity of many writers. I do not believe, indeed, that the climates of different regions of the old world have undergone so great an alteration in their temperatures, as has often been supposed. I am not ignorant of what has been written upon this subject by Dr. H. Williamson, the abbe Mann, Mr. Mallet, and other writers. But I think it may be shown, and I hope it will be shown, that these writers have not taken extensive views of the great and important question which they have treated. But I would not be understood to contend for the invariable uniformity and constancy of the temperature of the Globe.—In regard to North-America, my own inquiries have fully satisfied me, that no essential or permanent change in the temperature of those parts of this continent with which we are the best acquainted, has taken place.—B S. B

STUDY V.

REPLY TO THE OBJECTIONS AGAINST PROVIDENCE, FOUNDED ON THE DISORDERS OF THE VEGETABLE KINGDOM.

THE Earth is, say the Objectors, a garden very injudiciously laid out. Men of wit, who never travelled, have amused themselves with painting it, when proceeding from the hand of Nature, as if the giants had been a fighting in it. They represent it's rivers flowing at random ; it's morasses as vast collections of mud ; the trees of it's forests turned upside down ; it's plains buried under rocks, or overspread with briars or thorns ; all it's high ways rendered unpassable ; all it's culture the puny efforts of human genius. Such representations, though picturesque, have, I, acknowledge, sometimes afflicted me, because they inspired me with distrust of the AUTHOR of Nature. To no purpose could it be supposed that in other respects He had loaded Man with benefits ; one of our first and most pressing necessities had been overlooked, if He had neglected to care for our habitation.

The inundations of rivers, such as those of the Amazon, of the Oroonoko, and a great many others, are periodical. They manure the lands which they inundate. It is well known, besides, that the banks of those rivers swarmed with populous nations before any European had formed a settlement there. The inhabitants derived much benefit from these inundations, partly from the abundance of the fisheries, partly from the fertility communicated to the lands. So far from considering them as convulsions of Nature, they received them as blessings from Heaven, just as the Egyptian prized the overflowings of the Nile. Was it then a mortifying spectacle to them to see their deep forests intersected with long alleys of water, which they could without trouble traverse in all directions in the canoes, and pick the fruits at their ease ? Nay, certain tribes, such as those of the Oroonoko, determined by these accommodations, had acquired the singular habit of dwelling on the tops of trees, and of seeking under their foliage, like the birds, an habitation, and food, and a fortress. Whatever may be in this, most of them inhabited only the banks of the rivers, and preferred them to the vast deserts with which they are surrounded, though not exposed to inundations.

We see order only where we can see corn grow. The habit which we have acquired of confining the channels of our rivers within dikes and mounds, of gravelling and paving our high roads, of applying the straight line to the alleys in our gardens, and to our basons of water, of squaring our parterres, nay, our very trees, accustoms us insensibly to consider every thing which deviates from our rectangles, as abandoned to confusion. But it is in places with which we have been tampering, that we frequently see real disorder. We set fountains a playing on the tops of mountains ; we plant poplars and limes upon rocks ; we throw our vineyards into valleys, and raise our meadows to the declivities of hills.

Let these laborious exertions be relaxed ever so little, and all such petty levellings will presently be confounded under the general levelling of Continents, and all this culture, the work of Man, will disappear before that of Nature. Our sheets of water degenerate into marshes ; our hedge-row elms burst into luxuriancy ; every flower is choked, every avenue closes : the vegetables natural to each soil declare war against the strangers ; the starry thistle and vigorous verbascum, stifle under their broad leaves the English short grassy sod ; thick crops of rye-grass and trefoil gather round the trees of Palestine ; the bramble scrambles along their stem, with it's prickly claws, as if mounting a breach ; tufts of nettles take possession of the urn of the Naiads, and forests of reeds of the forges of Vulcan ; greenish scales of mnium corrode the faces of our Venuses, without paying any respect to their beauty. The trees themselves lay siege to the castle ; the wild cherry, the elm, the maple, mount upon it's ridges, plunge their long pivots into it's lofty pediments, and at length obtain the victory over it's haughty cupolas. The ruins of a park no less merit the reflections of the Sage, than those of the empire : they equally demonstrate how inefficient the power of Man is, when struggling against that of Nature.

I have not had the felicity, like the primitive Navigators, who discovered uninhabited islands, to contemplate the face of the ground as it came from the hand of the CREATOR ; but I have seen portions of it which had undergone alterations sufficiently inconsiderable to satisfy me, that nothing could then equal their virgin beauties. They had produced an influence

on the first relations which were formed by them, and had diffused over these a freshness, a colouring, a native grace inexpressible, which will ever distinguish them to advantage, notwithstanding their simplicity, from the learned descriptions which have been given of them in modern times.

To the influence of these first aspects I ascribe the superior talents of the earlier Writers who have painted Nature, and the sublime enthusiasm which a Homer and an Orpheus have transfused into their poesy. Among the Moderns, the Historian of *Anson's* expedition, *Cook*, *Banks*, *Solander*, and some others, have described several of these natural sites in the islands of Tinian, Masso, Juan Fernandez, and Otaheité, which have delighted all person's of real taste, though these islands had been in part degraded by the Indians and Spaniards.

I have seen only countries frequented by Europeans, and desolated by war, or by slavery : but I shall ever recollect with pleasure two of those sites, the one on this side the Tropic of Capricorn ; the other beyond the sixtieth degree of North latitude. Notwithstanding my inability, I am going to attempt a sketch of these, in order to convey as well as I can an idea of the manner in which Nature disposes her plans in Climates so very opposite.

The first was a part, then uninhabited, of the Isle of France, of fourteen leagues extent, which appeared to me the most beautiful portion of it, though the black maroons, who take refuge there, had cut down on the sea-shore the lataniers with which they fabricate their huts, and on the mountains the palmettos, whose tips they use as food, and the liannes, of which they make fishing-nets. They likewise degrade the banks of the rivulets, by digging out the bulbous roots of the nymphæa, on which they live, and even those of the Sea, of which they eat, without exception, every species of the shelly tribes, and which they leave here and there on the shore in great piles burnt up. Notwithstanding these disorders, that part of the island had preserved traces of it's ancient beauty. It is perpetually exposed to the South-east wind, which prevents the forests that cover it from extending quite down to the brink of the Sea ; but a broad selvage of turf, of a beautiful sea-green, which surrounds it, facilitates the communication all around, and harmonizes on

the one side with the verdure of the woods, and on the other with the azure of the billows.

The view is thus divided into two aspects, the one presenting land, the other water. The land-prospect presents hills flying behind each other, in the form of an amphitheatre, and whose contours, covered with trees in pyramids, exhibit a majestic profile on the vault of Heaven. Over these forests rises, as it were, a second forest of palmettos, which balance above the solitary valleys their long columns, crowned with party-coloured plumes of palms, and surmounted with a spiral peak. The mountains of the interior present at a distance oval-shaped rocks, clothed with great trees, and pendant liannes, floating like drapery by every breath of the wind. Above these rise lofty pinacles, round which are continually collected the rainy clouds; and when these are illuminated by the rays of the Sun, you see the colours of the rainbow painted on their peaks, and the rain-water flowing over their dusky sides in brilliant sheets of crystal, or in long fillets of silver. No obstacle prevents your perambulating the borders which embellish their sides and their bases, for the rivulets which descend from the mountains present along their banks slips of sand, or broad plates of rock, from which they have washed the earth clean away. Besides, they clear a free passage from their source to the place of their discharge, by undermining the trees which would grow in their channel, and by fertilizing those which do grow on their margin; and they expand over these through their whole course great arches of verdure, which fly off in perspective, and which are visible from the shore of the Sea. The liannes interweave themselves along the circumference of the arches, secure their arcades against the winds, and decorate them most beautifully, by opposing to their foliage other foliages, and to their verdure garlands of glossy flowers, or pods of various colours. If a tree, wasted by age, happens to fall down, Nature, which universally hastens on the destruction of all useless beings, covers it's trunk with maiden-hair of the most beautiful green, and agarics undulated with yellow, saffron, and purple, which feed on it's spoils.

Toward the sea side, the turf which borders the island is up and down sowed with thickets of latanier, whose palms, formed into a fan, and attached to pliant membranes, radiate in the air

like so many verdant suns. These lataniers advance even into the Sea, on the capes of the island, with the land fowls which inhabit them; while the small bays, swarming with multitudes of sea-fowl which swim in the water, and which are paved, if I may be allowed the expression, with madrépores of the colour of the peach-blossom; the black rocks covered with rose-coloured nerits, and shells of every kind, penetrate into the island, and reflect, like so many mirrors, all the objects of the Land and of the Heavens. You would imagine that you saw the birds flying in the water, and the fishes swimming among the trees, and you would be tempted to say, Here is the marriage of *Terra* and *Oceanus*, who thus blend and confound their domains.

In the greatest part even of uninhabited islands lying between the Tropics, when the discovery of them was made, the banks of sand which surround them were found to be filled with turtle, which came hither to lay their eggs, and with the scarlet flamingos, which, as they sit on their nests, resemble burning torches. They had besides, a border of mangliers, covered with oysters, which opposed their floating foliage to the violence of the waves, and of cocoa-trees loaded with fruit, which advancing into the very sea along the breakers, presented to the mariner's eye, the aspect of a city with it's ramparts and it's avenues, and announced to them from afar the asylum prepared for them by the God of the Seas. These different kinds of beauty must have been common to the isle of France, with many other islands, and were in all probability destroyed by the craving necessities of the first mariners who landed upon them. Such is the very imperfect representation of a country, the climate of which, according to ancient Philosophers, was uninhabitable, and the soil of which modern Philosophers consider as a scum of the Ocean, or of volcanos.

The second rural scenery, which I surveyed with rapture, and of which I am going to attempt a description, was in Russian Finland, when I was employed, in 1764, on a visitation of it's fortresses with the Generals of the corps of Engineers, in which I then served. We were travelling between Sweden and Russia, through a country so little frequented, that the first had encroached on the great line of demarkation which separates

the boundaries of the two countries. It was impossible to get through in a carriage, and we were under the necessity of employing the country people to cut down the trees, that our equipages might follow us. We were able, however, to penetrate in every direction on foot, and frequently on horseback, though we were obliged to inspect the windings, the summits, and the smallest recesses of a great number of rocks, in order to ascertain their natural capability of defence, and though Finland is so covered with these, that ancient Geographers have given it the surname of *Lapidosa* (stony.)

Not only are these rocks scattered about in great blocks over the surface of the earth, but the valleys, and entire hills, are there in many places formed of a single mass of solid rock. This rock is a soft granite which exfoliates, and whose scurf fertilizes the plants, at the same time that the enormous mass shelters them from the North-wind, and reflects on them the rays of the Sun, by their curves and the particles of mica with which it is filled. The bottoms of these valleys were skirted with long borders of meadow, which every where facilitate the communication. At the places where they were pure rock, as in their original state, they were covered with a plant, called by the natives *Klukva*, which thrives on the rock. It comes out of the clefts, and seldom rises higher than a foot and a half; but it spreads in all directions, and extends far and wide. Its leaves and verdure resemble those of the box, and its boughs are loaded with a red berry, good to eat, resembling the strawberry.

The fir, the birch, and the service-tree vegetated wonderfully well on the sides of those hills, though in many places they found scarcely earth sufficient in which to insert their roots. The summits of most of them were rounded in the form of a scull-cap, and rendered quite glistening by the water which oozed across the long crevices that furrowed them. Many of these scull-caps were perfectly bare, and so slippery, that it was difficult to walk over them. They were crowned round and round with a broad belt moss of an emerald green, out of which started here and there an infinite number of mushrooms of every form, and of every colour. Some of them were shaped like large scarlet-coloured tweezer-cases, studded with dots of white; others were orange-coloured and formed like a parasol; others

yellow as saffron, and of the oblong form of an egg. Some were of the purest white, and so well rounded, that you would have taken them for ivory draughts-men.

These mosses and mushrooms spread along the threads of water which flowed from the summits of the rocky hills, extending in long rays across the woods with which their sides were covered, and proceeded to skirt their extremities, till they were confounded with a multitude of strawberry and raspberry plants. Nature, to indemnify this country for the scarcity of apparent flowers to please the eye, of which it produces but few, has bestowed their perfumes on several plants, such as the *calamus aromaticus*, the birch which in Spring exhales a kind of odour of roses, and the fir, the apple of which is sweet-scented. She has, in like manner, diffused the colours of flowers the most agreeable, and the most brilliant, on the most common of vegetables, such as on the cones of the larch, which are of a beautiful violet, on the scarlet grains of the sorb-apple, on mosses and mushrooms, and even on turnip-radishes.

On the subject of this last vegetable, hear what the accurate *Corneille le Bruyn* says, in his *Voyage to Archangel*:* “During our residence among them (the Samoiédes), they brought us several sorts of turnips, of various colours, and extremely beautiful. Some of them were violet-coloured, like our plumbs, gray, white, yellowish, all of them streaked with red, like vermillion, or the finest laca, and as grateful to the eye as a pink. I painted some of them on paper in water-colours, and sent part to Holland, in a box filled with dry sand, to one of my friends, who is fond of such curiosities. I carried those which I had painted to Archangel, where no one would believe they were copied after Nature, till I produced the turnips themselves: a proof that no great attention is paid there to the rarest and most curious productions of Nature.”

I take those turnips to be of the radish sort, the bulb of which grows above ground. At least I presume so, from the drawing itself of *Corneille le Bruyn*, and from having seen such in Finland; they are in a taste superior to that of our colewort, and have a flavour similar to the artichoke bottom. I have produced these testimonies of a Painter, and that Painter a Dutch-

* Vol. iii. p. 21.

man, respecting the beauty of those coloured vegetables, to correct the prejudice with which so many are hurried away, that in the Indies only the Sun gives a magnificent colouring to plants. But nothing, in my opinion, equals the beautiful green of the plants of the North, especially in the Spring. I have frequently admired, in particular, that of the birch, of the turf, and of the mosses, some of which are glazed with violet and purple. The solemn firs themselves, then burst into festoons of the most delicate green; and when they come to throw from the extremity of their branches the yellow tufts of stamina, they appear like vast pyramids, loaded all over with little lamps.

We encountered no obstacle in traversing their forests. Sometimes there lay in the way an aged birch, laid low by the hand of Time, and internally consumed by the worm; but in stepping on the rind, it supports you like a piece of thick leather. The wood of these birches decays very fast, and their bark, which no humidity is able to corrupt, is carried away, on the melting of the snows, into the lakes, where it swims about all in one piece. As to the firs, when they fall, humidity and the mosses consume them in a very little time. This country is intersected with great lakes, which every where present new means of communication, as they penetrate far into the land by their branching gulfs, and exhibit a new species of beauty, by reflecting in their still waters the openings of the valleys, the mossy hills, and the pendent firs bending from the promontories over their shores.

It would be no easy matter to describe the hospitable reception which we found in the solitary mansions of those northern regions. Their masters exerted themselves in every possible way to detain us among them for many days together. They sent to the distance of ten, of fifteen leagues, invitations to their friends and relations, to come and assist them to entertain us. The days and the nights passed away in dancing and festivity. In the cities, the principal inhabitants regaled us by turns. Amidst this hospitable conviviality, we made the tour of the cities of poor Finland, Wiburg, Villemansstrand, Fredericksham, Nislot, and several others. The castle of this last town is situated on a rock at the discharge of Lake Kiemen, which surrounds it with two cataracts. From its platforms you perceive the vast extent of that lake. We dined in one of its four

towers, in a small apartment illuminated by windows like gun-ports. It is the very apartment in which the unfortunate *Ivan* was so long confined, who descended from the Throne of the Russian Empire, at the age of two years and a half. But this is not the place to expatiate on the influence which moral ideas may diffuse over Landscapes.

Plants then are not scattered about at random over the Earth; and though nothing has been hitherto said respecting their general arrangement in different Climates, this simple sketch is sufficient to demonstrate, that there is order in their combination. If we examine, in like manner, however superficially, their expansion, their attitude, their magnitude, and proportions, we shall find that there is as much harmony in the aggregation of their parts, as in that of their species. It is impossible in any one respect to consider them as mere mechanical productions of heat and cold, of dryness and humidity. Our scientific Systems have brought us back precisely to the opinions which precipitated barbarous Nations into idolatry, as if it were necessary that the perfection of our illumination should be the re-commencement and return of our darkness; conformably to the well-grounded censure of the Author of the Book of Wisdom: *Aut ignem, aut spiritum, aut citatum aerem, aut gyrum stellarum, aut nimiam aquam, aut solem & lunam, rectores orbis terrarum Deos putaverunt*:* “They could not out of the good things that are
“ seen know him that is; neither, by considering the works, did
“ they acknowledge the Work-master: but deemed either fire,
“ or wind, or swift air, or the circle of the stars, or the violent
“ water, or the lights of Heaven, to be the Gods which govern
“ the world.

All these physical causes united could not have determined the port of one single moss. In order to be convinced of this, let us begin with examining the circulation of plants. It has been laid down as an indubitable principle, that their saps ascend through the wood, and re-descend through the rind. To the experiments which have been detailed in proof, I shall oppose only the instance of a great chesnut-tree, in the garden of the Thuilleries, near the terrace of the Feuillants, which for twenty years past has had no bark round it's upper part, and which

* Wisdom of Solomon, chap. xiii. ver. 2.

nevertheless is in perfect vigour. Many elms on the Boulevards are in the same state. On the other hand, we have seen old hollowed willows which have not a bit of good wood left. Besides, how is it possible to apply this principle of vegetation to a multitude of plants, some of which are composed entirely of tubes, and to others which have no rind, being enclosed only in dry pellicles?

Neither is there more truth in the supposition that they rise in a perpendicular line, and that to this direction they are determined by the action of columns of air. Some, it must be allowed, do follow this direction, as the fir, the stalk of corn, the reed. But a much greater number deviate from it, such as creeping plants of every species, vines, liannes, French-beans, and many others. Others ascend vertically, and having arrived at a certain height, in an air perfectly unobstructed, fork off in various tiers, and send out their branches horizontally, as the apple-tree; or incline them toward the Earth, like firs; or hollow them in form of a cup, like the sassafras; or round them into a mushroom's head, like the pine; or straighten them into a pyramid, like the poplar; or roll them as wool on the distaff, like the cypress; or let them float at the discretion of the winds, like the birch.

All these attitudes may be seen under the same bearing of the wind. Nay, there are some which assume forms that all the art of the gardener could hardly impress upon them. Such is the badamier of the Indies, which grows up into the form of a pyramid, and bears it divided into stories, like the king of the chess-board. There are plants uncommonly vigorous which, far from pursuing the vertical line, recede from it the very moment they get above ground. Such is the false potatoe of India, which loves to crawl along the sand of the shores in hot countries, covering whole acres in it's progress. Such, too, is the ratan of China, which frequently grows in similar situations. These plants do not crawl from weakness. The scions of the ratan are so strong, that the Chinese make cordage of them for their shipping; and when they are on the ground, they serve as a trap for the deer, who find it impossible, with all their force, to disengage themselves. They are nets spread out by the hand of Nature.

I should never have done were I to run over ever so hastily the different parts of vegetables; what I have said is evidence sufficient, that there is not a single one whose direction is determined by the vertical column of the air. This error has gained currency, from it's being taken for granted that plants affected the greatest volume of air; and this error in Physics has produced another in Geometry; for on this supposition they must all precipitate themselves to the Horizon, because there the column of air is more considerable than in the Zenith. We must, in like manner, reject the consequences which have been deduced from it, and laid down as principles of Jurisprudence for the division of lands in our boasted mathematical treatises; such is the following, *That no more wood, or corn, or grass, can grow upon the declivities of a mountain, than what would grow on the area of it's basis.* There is not a wood-cutter, nor hay-maker in the world, who could not demonstrate the contrary from his experience.

Plants, it has been said, are mechanical bodies.* Well, then, try to construct a body so slim, so tender, so fragile, as that of a leaf, which shall for whole years resist the winds, the rains, the keenest frost, the most ardent Sun. A spirit of life, independent of all Latitudes, governs plants, preserves them, re-produces them. They repair the injuries which they may have sustained, and skin over their wounds with a new rind. The pyramids of Egypt are crumbled into powder; but the grasses which cloathed the soil while the Pharaohs filled the throne subsist to this day. How many Greek and Roman sepulchral monuments, the stones of which were rivetted with iron, have one after another disappeared! Nothing remains around their ruins, except the cypresses which shaded them!†

* No sensible naturalist now believes, that vegetables are "mechanical bodies." They are organized bodies, endued with life, with the property of irritability, and in all probability, with more or less of sensibility, or the power of feeling. If this last property cannot be proved to exist in plants, are there not *animals*, also, in which the existence of the principle of feeling is only rendered *probable* from the phenomena which are presented to us?

B. S. B.

† This is beautiful! Plants, indeed, are not immortal; that is, the species of many plants may perish, amid the revolutions of this changing earth. But compared to the most curious and laboured specimens of human workmanship, the meanest vegetable is, indeed, longevous. Where do we now find

It is the Sun, say they, who gives existence to vegetables, and who maintains that existence. But that great agent of Nature, all-powerful as he is, must not be considered as the only determining cause even of their expansion. If his heat invites most of those of our Climates to open their flowers, it obliges others to shut them. Such are, of this last description, the great nightshade of Peru, and the *arbor tristis* (the sad tree) of the Moluccas, which flower only in the night-time. Nay, his remoteness from our Hemisphere does not destroy in it the power of Nature. At that season vegetate most of the mosses which clothe the rocks with an emerald-coloured green; and then the trunks of trees cover themselves in humid situations with plants imperceptible to the naked eye, called *Mnium* and *Lichen*, which gave them the appearance in frosty weather of columns of green bronze. These vegetations, in the severity of Winter, overturn all our reasonings respecting the universal effects of heat, as plants of an organization so extremely delicate seem to need, in order to their expansion, a temperature the most gentle.

Again, the fall of the leaf itself, which we have been taught to consider as an effect of the Sun's absence, is not occasioned by the cold. If the palm retains it's foliage all the year round in the South, the fir is equally an evergreen in the North. The birch, it is true, the larch, and several other species of trees, shed their leaves in northern Climates on the approach of Winter; but a similar depredation is likewise made on other trees to the Southward. It is the resinous substance, we are told, which preserves the foliage of the fir in the North; but the larch, which is likewise a resinous plant, is stripped of it's verdure in Winter; whereas the *filix*, the ivy, the privet, and many other species, which are not resinous, continue with us in full verdure at all seasons.

Without having recourse to mechanical causes, the effects of which always contradict themselves whenever you attempt to generalize them. Why not recognize, in these varieties of vegetation, the steady and uniform direction of a Providence?

the walls of Babylon! But the hyssop, or the moss, which covered those walls, still exists, and will, in all probability, continue to exist so long as the waters of the Tigris or Euphrates shall continue to flow.—B. S. B

That Providence has assigned to the South trees always green, and has clothed them with a broad foliage, to shelter the animal creation from the heat. In another respect, likewise, have the animals of hot climates been tenderly cared for, in being provided with clothing denuded of hair, consequently light and cool; and in having their habitations garnished with green ferns and liannes, ever fresh and ever comfortable. Neither has bountiful Nature neglected the animals of the North. She has spread as a roof over their heads the evergreen firs, whose lofty and tufted pyramids ward off the snow from their roots, and whose branches are so well furnished with long gray mosses, that the trunk is rendered almost invisible; for a bed, she has accumulated a bank of moss on the ground, in many places more than a foot in thickness; and the soft and dry leaves of many trees, which fall precisely at the approach of the inclement season: finally, their provision too is laid up in store, namely, the fruits of those very trees which have then arrived at full maturity. To these she has added, here and there, the scarlet clusters of the sorb-apple, which sparkling afar over the whiteness of the snows invite the birds to an asylum; so that the partridge, the moor-cock, every species of snow-bird, the hare, the squirrel, frequently find under the shelter of the same fir a lodging, food, and the means of warmth.

But one of the greatest blessings of Providence conferred on the animals of the North, is the clothing of them with furred garments of long and thick hair, which regularly grow in Winter, and fall off in Summer. Naturalists, who consider the hair of animals as a species of vegetation, are at pains to account for this growth and decay, from the influence of heat. They pretend to support their system by the instance of the human hair and beard, which grow rapidly in Summer. But I would ask them, how it comes to pass that in cold countries horses, which in Summer are sleek and smooth, assume in Winter a long and shaggy coat, like the fleece of a sheep? To this they reply, It is the internal heat of their body, increased by the external action of the cold, which produces this wonderful phenomenon.

This is all very well. But I am under the necessity of objecting, that cold does not produce this effect on the human beard and hair, for it retards their growth; that besides, in the case of animals on which Providence bestows a clothing pecu-

liarly warm, the hair is much longer and thicker on those parts of their body that have the least natural heat, such as the tail, which is very bushy in horses, martens, foxes, and wolves ; that this hair is short and thick on the parts which have most natural heat, as the belly. Their backs, their ears, and frequently their very paws, are the parts most amply furnished with hair. But I satisfy myself with merely proposing this last objection ; the external and internal heat of an African lion ought surely to be at least as ardent as that of a Siberian wolf ; whence is it then that the first is smooth, as if newly shaven, whereas the other is shagged up to the eyes ?

The cold, which we have been taught to consider as one of the greatest obstacles of vegetation, is as necessary to certain plants as heat is to others. If those of the South could not thrive in the North, those of the North would not succeed better in the South. The Dutch have made many a vain attempt to make the fir grow at the Cape of Good Hope, in order to find a supply of ship-masts, which sell at a very high price in India. Many planters in the Isle of France have made attempts equally fruitless to raise in that island the lavender, the daisy, the violet, and other plants of our temperate climates. Alexander, who transplanted whole nations at his pleasure, could not, with all his efforts, make the ivy of Greece to grow in the vicinity of Babylon,* though he was very ambitious of acting in India the character of Bacchus in complete style.

I am persuaded, however, that it might be possible to succeed in effecting those vegetable transmigrations, by employing ice in the South for the propagation of the plants of hot climates. I do not believe there is a single spot on the Globe in which we could not, with a little address and industry, procure ice as easily as we can procure salt. In the whole course of my travels, I have never met with a temperature more sultry than that of the Island of Malta, though I have twice crossed the Line, and have passed a considerable part of my life in the Isle of France, where the Sun is vertical twice a year. The soil of Malta consists of little hills of white stone, which reflect the rays of the Sun with so much force, that the eye-sight is sensibly affected by it ; and when the wind from Africa, known by the

* See Plutarch and Pliny.

name of *Syroco*, which issues from the sands of *Zara*, on it's way to melt the ices of the North, comes to pass over that Island, the air is as hot as the breath of an oven. I recollect at that season a figure of Neptune in bronze on the sea-shore, the metal of which was heated to such a degree that you could scarcely apply your hand to it. They, however, imported into the island snow from Mount Etna, which is sixty leagues distant; they kept it for months together, laid on straw in vaults, and it was to be bought for a farthing a pound weight, even when farmed out. Since then it is possible to have ice in Malta during the Dog-Days, I think it might be procured in every country of the Globe. Nature besides, as we have seen, multiplies icy mountains in the vicinity of hot countries. I may perhaps be here reproached with indicating the means of promoting the increase of luxury; but as the commonalty now live only on the luxury of the rich, my suggestion may tend to promote at least the extension of the science of Nature.

So far is cold from being the enemy of all plants, that it is in the North we find forests of the tallest growth, and of the greatest extent in the World. It is only at the foot of the eternal snows of Mount Lebanon that the cedar, the king of vegetables, rises in all his majesty. The fir which is, next to him, the greatest tree of our forests, arrives at a prodigious size only on icy mountains, and in the cold climates of Norway and Russia. Pliny tells us, that the largest piece of timber which had ever been seen at Rome, up to his time, was a vast log of fir a hundred and twenty feet long, and two feet square at both ends, which Tiberius had conveyed from the cold mountains of Voltolino in Piedmont, and which Nero employed in his amphitheatre. You may judge, says he, what must have been the height of the tree as it grew, when a cutting of it had such dimensions. However, as I believe that Pliny means Roman feet, which are of the same dimension with those of the Rhine, we must subtract from this measurement about a twelfth part nearly. He quotes besides, the fir mast of the vessel which brought from Egypt the obelisk that Caligula ordered to be set up in the Vatican; this mast was four fathoms in circumference. I know not where it might have grown. But I myself have seen firs in Russia, compared to which those of our temperate climates are mere twigs. Among others I remember to have seen, between Petersburg and Moscow, two logs which exceed-

ed in size the largest of our masts for ships of war, though these consist of several pieces. They were cut from the same tree, and served as mounting blocks at the gate of a peasant's farm-yard. The boats which convey provisions from Lake Ladoga to Petersburg are not much smaller than those which ply between Rouen and Paris. They are constructed of fir planks from two to three inches thick, sometimes two feet broad, and whose length is that of the whole barge. The Russian carpenters of the cantons where they are built, make only a single plank out of one tree, timber being in such plenty there, that they do not take the trouble to saw it.

Before I had travelled into northern countries, I took it for granted, in conformity to the laws of our Physics, that the earth must there be stripped of every thing like vegetation by the rigor of the cold. I was very much astonished to find there the largest trees I had ever seen in my life, and growing so near each other, that a squirrel could easily scamper over great part of Russia without touching the ground, by springing from branch to branch. This vast forest of firs covers Finland, Ingria, Estonia, the whole space comprehended between Petersburg and Moscow, and thence extends over a great part of Poland, where oaks begin to appear, as I know from actual observation, having travelled through these countries. But what I have seen is a very small part only of those immense forests, for it is well known that they extend from Norway all the way to Kamschatka, some sandy deserts excepted; and from Breslau to the shores of the Frozen Ocean.

I shall conclude this article with refuting an error alluded to in the preceding Study; namely, that cold is diminished in the North, in proportion as the forests are cut down. As this position has been advanced by some of our most celebrated Writers, and afterwards retailed, as the custom is, by a multitude of others; it is of importance to overturn it, as being highly prejudicial to rural economy. I had long adopted it as incontestibly certain, on the faith of History; but I was at length cured of my mistake, not however by books, but by simple peasants.

One day in Summer, about two o'clock after noon, being about to cross the forest of Ivry, I saw some shepherds with their flocks, who kept at a considerable distance from it, reposing under the shade of some trees that were scattered up and down through the country. I asked them why they did not go

with their flocks to take shelter in the forest from the heat of the Sun. They told me it was too hot there at that time of the day, and that they never drove their sheep thither except in the morning and evening. Being desirous however of traversing in broad day the woods in which *Henry IV.* had hunted, and of arriving betimes at Anet, to take a view of the country-palace of *Henry II.* and of the tomb *Diana* of Poitiers, his mistress, I had engaged a lad belonging to one of the shepherds to attend me as a guide, which was a very easy matter to him, for the great road leading to Anet crosses the forest in a straight line ; and it is on that side so little frequented, that I found it covered in many places with tufts of grass and strawberry plants. I felt all the way as I walked along a stifling heat, and much more ardent than was at that hour felt in the open country. I did not begin to respire freely till I had got fairly clear of it, and had made my escape from the edge of the forest more than the distance of three musket shot. In other respects those shepherds, that solitude, that silence of the woods, blended with the recollection of *Henry IV.* appeared to me much more affecting and sublime than the emblems of the chace in bronze, and the cyphers of *Henry II.* interwoven with the crescents of *Diana*, which embellish on all sides the domes of the Castle of Anet. This royal residence, loaded with ancient trophies of love, inspired at first a mixed emotion of pleasure and melancholy, which gradually subsided into profound sorrow, on recollecting that this love was illicit ; but this was followed at last by sentiments of veneration and respect, which took complete possession of my mind, on being informed that by one of those revolutions to which the monuments of men are so frequently subjected, the castle was then inhabited by the virtuous Duke of *Penthievre*.

I have since reflected on what the shepherds told me respecting the heat of the woods, and on what I myself had experienced ; and I have in fact remarked that in the Spring all plants are more forward in the vicinity of the woods, and that you find violets in flower on their borders much earlier than you gather them on the open plain, or on a naked hill. Forests then shelter the land from cold in the North ; but what is equally wonderful, they shelter it likewise from the heat in warm countries. These two opposite effects are produced entirely from the different forms and disposition of their leaves. In the North, those of the fir, the larch, the pine, the cedar, the juniper, are

small, glossy, and varnished ; their delicacy, their varnish, and the endless variety of their direction, reflect the heat around them a thousand different ways : they produce nearly the same effects as the hair of the animals of the North, whose furs are warm in proportion as the hair is fine and glossy. Besides, the leaves of some species, as of the fir and of the birch, are perpendicularly suspended from the branches by long and moveable membranes, so that with every breath of the wind they reflect all around the rays of the Sun, like so many mirrors.

In the South, on the contrary, the palms, the tallipot, the cocoa, the banana, bear leaves, which on the side next the ground are rather rough than glossy, and which spreading horizontally form a deep shade below, where there is not the least reflection of heat. I admit, at the same time, that the clearing away of forests dispels the coldness occasioned by humidity ; but it increases the dry and sharp colds of the North, as has been found on the lofty mountains of Norway, which were formerly cultivated, but are now uninhabitable, because they are completely stripped of their woods.

This clearing of the ground likewise increases the heat in warm countries, as I have had occasion to observe in the Isle of France on several parts of the coast, which are become so parched, since every species of trees has been swept away, that they are at this day absolutely uncultivated. The very grass which pushes away during the rainy season, is in a short time quite burnt up by the Sun. What is still worse, there results from this parchedness of the coasts the drying up of a great many rivulets ; for the trees planted on the heights attract thither the humidity of the air, and fix it there, as we shall see in the Study on Plants. Besides, by destroying the trees which are on the high grounds, you rob the valleys of their natural manure, and the plains of the pallsades which shelter them from the high winds. These winds desolate to such a degree the cultivation in many places, that nothing can be made to grow. I ascribe to this last piece of mismanagement the sterility of the heaths in Brittany. In vain has the attempt been made to restore their ancient fertility : it never can succeed, till you begin with recalling their shelter and their temperature, by re-sowing their forests. But there is a requisite prior even to this ; you must render the peasantry happy. The prosperity of a country depends before and above all things on that of it's inhabitant's.

STUDY VI.

REPLY TO THE OBJECTIONS AGAINST PROVIDENCE, FOUNDED ON THE DISORDERS OF THE ANIMAL KINGDOM.

WE shall continue to display the fecundity of Northern Regions, in order to overturn the prejudice which would ascribe this principle of life, in plants and animals only to the heat of the South. I could expatiate on the numerous and extensive chaces of elks, rein-deer, water-fowls, heath-cocks, hares, white bears, wolves, foxes, martens, ermines, beavers, and many others, which the inhabitants of the northern districts annually carry on, the very peltry of which, above what they employ for their own use, supplies them with a very considerable branch of commerce for the markets of all Europe. But I shall confine myself entirely to their fisheries, because these precious gifts of the Waters are presented to all Nations, and are no where so abundant as in the North.

From the rivers and lakes of the North are extracted incredible multitudes of fishes. *John Schæffer*, the accurate Historian of Lapland, tells us,* that they catch annually at Torneo no less than thirteen hundred boat-loads of salmon; that the pike there grow to such a size, that some are found as long as a man, and that every year they salt as many as are sufficient for the support of four kingdoms of the North. But these fisheries, however productive, fall far short of those of the Seas.† From the bosom of these is dragged the enormous whale, which is usually about sixty feet in length, twenty feet broad over the body and at the tail eighteen feet high, and which yields to a hundred and thirty barrels of oil. The fat is two feet thick, and in cutting it off they are under the necessity of using great knives six feet long.

From the Seas of the North annually take their departure innumerable shoals of fishes, which enrich the fishers of all Europe; such as cod, anchovies, sturgeon, dory, mackarel, pilchers, herrings, sea-dogs, belugas, sea-calves, porpoises, sea-horses, puffers.

* History of Lapland, by *John Schæffer*.

† Consult *Frederic Martens*, of Hamburg.

sea-unicorns, saw-fish, and the rest.—The size of them all is considerably larger than in temperate Latitudes, and they are divided into much more numerous species. There are computed as high as twelve species of the whale tribe; and plaice are caught in those seas of the enormous weight of four hundred pounds. But I shall farther confine myself to those fishes which are best known to us, herrings, for example. It is an incontestable fact, that the Seas of the North every year send out a quantity more than sufficient to feed all the inhabitants of Europe.

We are in possession of Memoirs which prove, that the herring fishery was carried on so far back as the year 1163, in the Straits of Sunda, between the Islands of Schonon and Seeland. *Philip de Mésières*, Governor to *Charles VI.* relates, in the *Old Pilgrim's Dream*, that in the year 1389, during the months of September and October, the quantity of herrings in those Straits was so prodigious, that "For several leagues together you might," says he, "have cut them with a sword; and it is credibly reported, that there are forty thousand boats which are employed in nothing else for two months but in catching herrings; each boat containing at least six persons, and many not less than ten; and besides these, there are five hundred great and small vessels of burden, employed wholly in picking, salting, and barrelling up the herrings." He make the number of persons engaged in this fishery amount to three hundred thousand, Prussians and Germans.

In 1610, the Dutch, who carry on the herring-fishery still farther to the North, where the fish is better, employed in it three thousand boats, fifty thousand fishermen, without reckoning nine thousand other vessels employed in barrelling and conveying them to Holland, and a hundred and fifty thousand persons, partly at sea, partly on shore, engaged in the carrying trade, in preparing and selling. At that period they derived a revenue from it of two millions six hundred and fifty thousand pounds sterling. I myself have witnessed in Amsterdam, in 1762, the joy of the populace expressed by displaying streamers and flags over the shops where that fish was exposed to sale on their first arrivals; and in every street this was the case. I have been informed in that city, that the Company established for carrying on the herring-fishery was richer, and fed more mouths, than

the East-India Company. The Danes, the Norwegians, the Swedes, the Hamburgers, the English, the Irish, and some traders of the ports of France, particularly of Dieppe, fitted out vessels for this fishery, but in too small a number for a fall of manna so plentiful, and so easily gathered.

In 1782, at the mouth of the Gothela, a small river which washes the walls of Gottenburg, one hundred and thirty-nine thousand barrels were cured by salt, three thousand seven hundred were smoaked, and two thousand eight hundred and forty-five casks of oil were extracted from what could not be preserved. The Gazette of France,* which contains an account of this fishery, remarks that, previous to 1752, these fishes had entirely disappeared for 72 years together. I ascribe their desertion of this coast to some naval engagement, which had chased them away by the noise of the artillery, as is the case with the turtle of the island of Ascension, which forsake the road for weeks together, when vessels passing that way discharge their great guns. It may perhaps be likewise accounted for from a conflagration of the forests, which might have destroyed the vegetables that attracted them to the coast.

The good Bishop of Berghen, *Pont Oppidan*, the *Fenelon* of Norway, who introduced into his popular sermons, complete tracts of Natural History, as being excellent articles of Theology, relates,† that when the herrings coasted along the shores of Norway, ‘The whales, which pursue them in great numbers, “ and which dart their water-spouts into the air, give to the “ Sea, at a distance, the appearance of being covered over with “ smoking chimnies. The herrings, in order to elude the pur- “ suit, throw themselves close in-shore into every little bay and “ creek, where the water, before tranquil, forms considerable “ swellings and surges, wherever they croud to make their es- “ cape. They branch off in such quantities that you may take “ them out in baskets-full, and the country people can even catch “ them by the hand.” After all, however, that the united efforts of all these fishers can effect, hardly any impression is made on their great general column, which coasts along Germany, France, Spain, and stretches as far as the Straits of Gibraltar; devoured the whole length of their passage by an innumerable

* Friday the 11th October, 1782.

† *Pont Oppidan's* Natural History of Norway

multitude of other fishes and sea-fowls, which follow them night and day, till the column is lost on the shores of Africa, or returns, as other Authors tell us, to the Climates of the North.

For my own part, I no more believe that herrings return to the Seas from whence they came, than that fruits re-ascend the trees from which they have once dropped. Nature is so magnificent in the entertainments which she provides for Man, that she never serves up the dishes a second time. I presume, conformably to the observation of Father *Lamberti*, a missionary in Mingrelia, that these fishes accomplish the circuit of Europe by going up the Mediterranean, and that the utmost boundary of their emigration is the extremity of the Black Sea; and this is the more probable, that the pilchers, which take their departure from the same places, follow the same track, as is proved by the copious fisheries of them carried on along the coasts of Provence and Italy. "Many herrings," says Father *Lamberti*,* "are sometimes seen in the Black Sea; and in the years when this happens, the inhabitants of the adjacent countries draw a flattering prognostic of a plentiful sturgeon-fishing season; and they deduce the opposite conclusion from the non-appearance of herrings. There was seen in 1642 a quantity so prodigious of them, that the Sea having thrown them on the shallows which separate Trebisonde from the country of the Abcasses, the whole was covered and surrounded with a bank of herrings, which was at least three hand-breadths high. The people of the country were under dreadful apprehensions that the air would be poisoned by the corruption of these fishes; but they were presently followed by enormous flocks of crows and rooks, which eat up the herrings, and cured the honest folks of their terror. The natives talk of a similar appearance before that period, only the quantity was much inferior."

The immense glut of herrings is undoubtedly matter of astonishment; but how is that astonishment increased, when it is considered that this column is not the half of what annually issues from the Seas of the North! It separates at the northern extremity of Iceland, and while one division proceeds to diffuse plenty over the shores of Europe, the other pushes forward to convey similar benefits to the shores of America. *Anderson*

* Account of Mingrelia, Thevenot's Collection.

informs us, herrings are in such abundance on the coasts of Iceland, that a shallop can with difficulty force it's way through the shoal by dint of rowing. They are accompanied by an incredible multitude of pilchers and cod, which renders fish so plenty in the island, that the inhabitants have them dried and reduced to meal with a grindstone, to become food for their oxen and horses.

Father *Rale*, a Jesuit and an American Missionary, speaking of the Savages who inhabit between Acadia and New-England, tells us,* "That they resort at a certain season to a river not far distant, where for the space of a month the fishes force their way upward in such quantities, that with hands sufficient fifty thousand barrels may be filled in a single day. These are a species of very large herrings, most agreeable to the taste when fresh. They are pressed upon each other to the thickness of a foot, and are taken out by pails-full, like water. The Savages dry them for eight or ten days, and live on them during their whole seed-time."

This testimony is confirmed by a great many others, and particularly by a Gentleman of English extraction, but a native of America, who has favoured us with a History of Virginia. "In Spring," says he,† "herrings push upwards in such quantities, along the rivulets and fords of rivers, that it is almost impossible to pass on horseback without trampling on those fishes. Hence it comes to pass, that at this season of the year those parts of the rivers where the water is fresh, are rendered fetid by the fish which they contain. Besides herrings, there may be seen an infinite number of shads, roach, sturgeon, and a few lampreys, which find their way from the Sea up the rivers."

It would appear that another column of those fishes issues from the North Pole, to the eastward of our Continent, and passes through the channel which separates America from Asia, for we are informed by a missionary that the inhabitants of the land of Yasso go to Japan to sell, among other dried fishes, ‡ herrings also. The Spaniards, who had been attempting discoveries to the north of California, find all the nations of those regions to be fish-eaters, and unacquainted with every kind of cultivation.

* Instructive Letters, vol. xxiii. page 199.

† History of Virginia, page 202.

‡ Ecclesiastical History of Japan. by Father *F. Soliar* Book xix chap. xi.

Though they landed there only in the middle of Summer, before perhaps the fishing season had commenced, they found pilchers in the greatest abundance, the native country and emigrations of which are the same, for vast quantities of a smaller size are taken at Archangel. I have eaten of them in Russia, at the table of Mareschal Count *Munich*, who called them the anchovies of the North.

But as the Northern Seas, which separate America from Asia, are not much known to us, I shall pursue this fish no further. I must however observe, that more than half of those herrings are filled with eggs, and if the propagation were to go on to it's full extent for three or four generations only, without interruption, the Ocean itself would be unable to contain them. It is obvious to the first glance of the eye, that the herring produces at least as many eggs as the carp. *M. Petit*, a celebrated practitioner in Surgery and Medicine, has found by experiment that the two parcels of eggs of a carp eighteen inches long, weighed eight ounces two drachms, which make four thousand seven hundred and fifty two grains; and that it required seventy-two of these eggs to make up the weight of one grain; which gives a product of three hundred forty-two thousand one hundred and forty-four eggs, contained in one roe weighing eight ounces and two drachms.

I have been somewhat diffuse on the subject of this particular species of fish, not in the view of promoting our commerce, which by it's offices, it's bounties, it's privileges, it's exclusions, renders every article scarce with which it intermeddles, but in compassion to the poorer part of the community, reduced in many places to subsist entirely on bread, while Providence is bestowing on Europe, in the richest profusion, the most delicate of fishes perhaps that swims in the Sea.* We are not to form our judgment from those which are brought to Paris after the season is over, and which are caught on our coasts; but from those which are caught far to the North, known in Holland by the name of *pickled herrings*, and which are thick, large, fat, with the flavour of a nut, so delicate and juicy, that they melt

* More than one epicure has already made this observation; but here is another, on which few are disposed to dwell, it is this, that in all cases, and in all countries, *the most common things are the best.*

away in the cooking, and are eaten raw from the pickle, as we do anchovies.

The South Pole is not less productive of fishes than the North. The nations which are nearest to it, such as the inhabitants of the islands of Georgia, of New Zealand, of Maire's Strait, of the Terra-del-Fuego, of Magellan's Strait, live on fish, and practice husbandry of no kind. That honest Navigator, Sir *John Narbrough*, says, in his *Journal of a Voyage to the South Seas*, that *Port-Desire*, which lies in 47 deg. 48 min. South Latitude, is so filled with penguins, sea-calves, and sea-lions, that any vessel touching there may find provisions in abundance. All these animals, which are there uncommonly fat, live entirely on fish. When he was in Magellan's Strait, he caught at a single draught of the net more than five hundred large fishes, resembling the mullet, as long as a man's leg; smelts twenty inches long; a great quantity of fish like the anchovy: in a word, they found of every sort such an abundant profusion, that they ate nothing else during their stay in those parts. The beautiful mother-of-pearl shells which enrich our cabinets, under the name of the Magellan-oyster, are there of a prodigious size, and excellent to eat. The lempit, in like manner, grows there to a prodigious magnitude. There must be, continues he, on these shores an infinite number of fishes to support the sea-calves, the penguins, and the other fowls, which live solely on fish, and which are all equally fat, though their number is beyond computation. They one day killed four hundred sea-lions in the space of half an hour. Of these some were eighteen feet long. Those which are only fourteen swarm by thousands. Their flesh is as tender and as white as lamb, and excellent food when fresh, but still better when it has been some time in salt. On which I must make this observation, that the fish of cold countries only take in salt easily, and retain in that state part of their flavour. It seems as if Nature intended thus to communicate to all the Nations of the Globe the abundance of the fisheries which issue from the frigid Zones.

The western coast of America, in that same Latitude, is not less amply supplied with fish. "Along the whole sea-coast," says the Peruvian *Garcillaso de la Vega*,* "from Aréquipa to

* History of the Incas, book v. chap. iii.

“Tarapaca, a track of more than two hundred leagues in length, they employ no other manure to dung the land, except the excrement of certain fowls, called sea-sparrows, of which there are flocks so numerous, as to exceed all belief. They inhabit the desert islands on the coast, and by the accumulation of their ordure, they whiten them to such a degree, that at some distance they might be taken for mountains covered with snow. The Incas reserved to themselves the right of disposing of those islands, as a royal boon to such and such a favourite province.” Now this dung was entirely the produce of the fishes on which those fowls constantly fed.

“In other countries, on the same coast,” says he,* “such as that of Atica, of Atitipa, of Villacori, of Malla, and Chilca, they dung the land with the heads of pilchers, which they sow there in great quantities. They put them in the ground at small intervals from each other, along with two or three grains of maize. At a particular season of the year the Sea throws upon the shore such quantities of live pilchers, that they have an abundant supply for food and for manure, and this to such a degree, that after these demands are satisfied, they could easily load whole ships with the overplus.”

It is obvious that the coast of Peru is nearly the boundary of the emigration of the pilchers which set out from the South Pole, as the coasts of the Black Sea are the boundary of that of the herrings which issue from the North Pole. The continuation and direction of these two bands, the pilchers of the South and the herrings of the North, are nearly of the same length, and their destinies are at last similar. It would appear as if certain Nereids were annually commissioned to conduct from the Poles those innumerable swarms of fishes, to furnish subsistence to the inhabitants of the temperate Zones; and that, having arrived at the termination of their course, in the hot Latitudes, where fruits are produced abundantly, they empty the gleanings of their nets upon the shore.

It will not be so easy a task, I confess, to refer to the beneficence of Nature the wars which animals wage with each other. Why should beasts of prey exist? Supposing me incapable of resolving this difficulty, Nature must not be accused of cruelty.

* Consult the same Work.

because I am deficient in mental ability. She has arranged what we do know with such consummate wisdom, that we are bound to give her credit for the same character of wisdom, in cases where we cannot find her out unto perfection. I will have the courage, however, to declare my opinion, and to offer a reply to this question; and so much the rather, as it affords me an opportunity of presenting some observations which I consider as at least new, if not worthy of attention.

First of all, Beasts of prey are necessary. What otherwise would become of the carcasses of so many animals which perish both on the land and in the water, and which they would consequently poison with infection. Several species of carnivorous animals, it must be allowed, devour their prey while yet living. But who can tell whether in this they do not transgress the law of their nature? Man knows very little of his own history, How is it possible he should know that of the beasts? Captain *Cook* observed, in a desert island of the Southern Ocean, that the sea-lions, the sea-calves, the white bears, the sots, the eagles, the vultures, lived in perfect concord, no one tribe giving the least disturbance to another. I have observed a similar good agreement among the fool and the frigate of the Island of Ascension. But, after all, we must not compliment them too highly on their moderation. It was merely an association of plunderers; they lived peaceably together, that they might devour unmolested their common prey, the fishes, which they all gulped down alive.

Let us revert to the great principles of Nature. She has made nothing in vain. She destines few animals to die of old age; nay, I believe that she permits Man alone to complete his career of life, because his old age alone can be useful to his fellow-creatures. To what purpose would serve among the brute creation grandsires destitute of reflection, to progeny brought into existence in the maturity of their experience? On the other hand, what assistance could decrepit parents find among children, which abandon them the instant they have learned to swim, fly, or walk? Old age would be to them a burthen from which they are delivered by the ferocious animals. Besides, from their unobstructed generations would arise a posterity without end, which the Globe is not sufficient to contain. The

preservation of individuals would involve the extinction of the species.

Animals might always live, I shall be told, in a proportion adapted to the places which they inhabit; but in that case they must cease to multiply; and from that moment farewell the loves, the nests, the alliances, the foresight, and all the harmonies which subsist among them. Every thing that is born is doomed to die. But Nature, in devoting them to death, takes from them that which could render the instant of it cruel. It is usually in the night-time, and in the hour of sleep, that they sink under the fangs and the teeth of their destroyers. Twenty strokes, sent home in one instant to the sources of life, afford no leisure to reflect that they are going to lose it. That fatal moment is not embittered to them by any of the feelings which render it so painful to most of the Human Race, regret for the past, and solicitude about futurity. Their unanxious spirits vanish into the shades of night, in the midst of a life of innocence, and frequently during the indulgence of the fond illusions of love.

Unknown compensations may perhaps farther sweeten this last transition. I shall observe at least, as a circumstance deserving the most attentive consideration, that the animal species, whose life is sacrificed to the support of that of others, such as that of insects, do not appear possessed of any sensibility. If the leg of a fly happens to be torn away, she goes and comes as if she had lost nothing; the cutting off a limb so considerable is followed by no fainting, nor convulsion, nor scream, nor symptom of pain whatever. Cruel children amuse themselves with thrusting straws into their anus; they rise into the air thus empaled; they walk about, and perform all their usual motions, without seeming to mind it. Others take lady-birds, tear off a large limb, run a pin through the nerves and cartilages of the thigh, and attach them with a slip of paper to a stick. These unfeeling insects fly humming round and round the stick unweariedly, and without any appearance of suffering pain. *Reaumur* one day cut off the fleshy and muscular horn of a large caterpillar, which continued to feed as if no mutilation had taken place. Is it possible to think that beings so tranquil in the hands of children and philosophers, endure any feeling of pain when they are gobbled down in the air by the birds?

These observations might easily be extended much farther: particularly to that class of fishes which have neither bone nor blood, and of these consist the greatest number of the inhabitants of the Seas, and they appear to be equally void of sensibility. I have seen between the Tropics a tunny, from the nape of whose neck one of the sailors scooped out a large slice of the flesh with a stroke of the harpoon, which was forced backward to his head, who followed the ship for several weeks, and was outdone by no one of his companions either in speed or in friskiness. I have seen sharks, after being struck with musket bullets, return to bite at the hook from which they had just before escaped, with their mangled throat.

We shall find besides a greater analogy between fishes and insects, if we consider that neither have bones nor blood; that their flesh is impregnated with a glutinous liquid, and which likewise appears to be the same in both, from it's emitting the same odour when burnt; that they do not respire by the mouth, but by the sides, insects by the tracheæ, fishes by the gills; that they have no auditory organ, but hear by means of the nervous impression made on their bodies by the commotion of the fluid element in which they live;* that they see all round the horizon from the disposition of their eyes; that they equally run to the light; that they discover the same avidity, and are for the most

* This is not correct. There is reason to believe that every species of fish and perhaps the greater number of the species of insects, do actually hear by means of true auditory organs. The organs of hearing in various fishes have been satisfactorily demonstrated by a number of eminent naturalists and anatomists; by Klein, Camper, Comparetti, Scarpa, Monro, John Hunter, &c. In some of the families of fishes, the auditory organs are more, in others less, complex. This is not the proper place to treat minutely of their structure; but one remarkable circumstance in regard to the auditory organs of fishes, deserves to be mentioned. The internal ear grows, as the fish increases in size; and, of course, "its magnitude is in the direct ratio of the bulk and age of the animal." This is not the case in the mammalia, in the birds, and in the animals called amphibia, by the naturalists. In regard to the vast class of insects, it will readily be confessed, that the organ of hearing in them is more uncertain, and indeed is far from being completely investigated in any one species. Fabricius, Scarpa, Comparetti, and other eminent naturalists, have written concerning the organ of hearing in the crawfish and other species of the genus cancer. The *antenne*, or feelers, are not, as some ingenious authors have supposed, the organs of hearing in insects.—

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part carnivorous; that in both *genera* the female is larger than the male; that these throw out their eggs to an infinite number without sitting on them: that most fishes pass on their birth through the state of insects, issuing from their eggs in form of worms, and even some in that of frogs, such as a species of fish in Surinam; that both are cased in scales; that many fishes are provided with beards and horns, like insects; that both the one and the other contain, in their categories, an incredible variety of forms peculiar to themselves; finally, that their constitutions, their metamorphoses, their manners, their fecundity, being the same, there is a powerful temptation to ascribe to these two numerous classes the same insensibility.

As to animals which have blood, let *Mallebranche* say what he pleases, they are sensible.* They express a sense of pain by the same signs which we do. But Nature has fenced them with thick hides, with long hair, with a plumage, which protect them against external blows. Besides, they are little, if at all exposed to cruel treatment, except from the hands of bad men.

Let us now proceed to consider the generation of animals. We have seen that the greatest and most numerous species of the Globe, in the animal and vegetable kingdoms, are produced in the North, independently of the heat of the Sun. Let us now enquire, whether the prolific power of fermentation be greater in the South. Certain Egyptians told Herodotus, that particular species of animals were formed of the fermented mires of the Ocean, and of the Nile. Whatever respect I have for the Ancients, I absolutely reject their authority in Physics. Most of their Philosophers have a sufficiently striking resem-

* And let good Saint-Pierre "say what he pleases," the animals without blood, or at least without red blood, are sensible also. This property of being sensible, or in other words, the faculty of feeling, belongs to all animals, as is most incontestibly shown by the numerous experiments of naturalists, especially within the last hundred years. Have not the nerves been demonstrated in snails, and an hundred other species of similar animals? Are not the nerves the organs of feeling? Has Saint-Pierre, then, so completely closed his eyes against the conviction forced upon us by experiments, as not to perceive, that when we tread upon the worm, or tear off the leg of a fly, it feels as one of us would feel?—Nor let it be said, that by thus conceding to these (seemingly contemptible) animals, the property of being sensible, we detract from the goodness or benevolence of the Creator. By this very property, these animals are rendered capable of a thousand pleasures and enjoyments.

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blance to our own. They observed sparingly, and reasoned copiously. If some of them, in the view of speaking peace to voluptuous Princes, have advanced that every thing proceeded from corruption, and returned to corruption again; others, more honest and sincere, have refuted them even in the earliest times.

It is not only certain that corruption produces no one living body, but is fatal to all, especially to those which have blood, and chiefly to Man. No air is unwholesome but where there is corruption. How could such a principle have generated in animals, feet provided with toes, nails, and claws; skins clothed with so many sorts of hair and plumage; jaws palisaded with teeth cut out in a form adapted, some for cutting and others for grinding; heads adorned with eyes, and eyes furnished with lids to defend them from the Sun? How could the principle of corruption have collected those scattered members; unite them by nerves and muscles; support them by bony substances, fitted with pivots and hinges; feed with them veins filled with a blood which circulates, whether the animal be in motion or at rest; cover them with skins so admirably provided with hairy furs, precisely adapted to the Climates which they inhabit; afterwards make them move by the combined action of a heart and a brain, and give to all these machines, produced in the same place, and formed of the same slime, appetites and instincts so entirely different? How could it have inspired them with the sensation of themselves, and kindled in them the desire of reproducing themselves by any other method than that which originally gave them existence?

Corruption, so far from conferring life on them, must have deprived them of it, for it generates tubercles, inflames the eyes, dissolves the blood, and produces an infinite number of diseases in most animals which respire it's emanations.* The ferment-

* Of all corruptions, that of the human flesh is most noxious. Of this a very singular instance is related by *Garcillaso de la Vega*, in his History of the Civil Wars of the Spaniards in the Indies, vol. i. part ii. chap. xlii. He observes, first, that the Indians of the islands of Barlovento poison their arrows, by plunging the points of them into dead bodies; and then adds, "I shall relate what I myself saw happen in the case of one of the quarters of the dead body of Carvajal, which was exposed on the great road to Collasuyu, to the south of Cusco. We set out a walking one Sunday, ten or twelve school-fellows of us, all mongrels, that is, the progeny of Spanish men by Indian women, the oldest not above twelve years of age. Having observed,

tation of any substance whatever could have formed no one animal, nor even the egg from which it issued. We find in the dunghills of our great towns, where so many substances ferment, organic particles of every species; entire bodies of animals, blood, plants, salts, oils, excrements, spirits, minerals, substances

“ as we went along in the open country, one of the quarters of Carvajal’s body, we took a fancy to go and look at it, and having come up, we found it was one of his thighs, the fat of which had dropped to the ground. The flesh was greenish, and entirely corrupted. While we were examining this mournful spectacle, a forward boy chanced to say, I could wager no one here dares to touch it; another replied, he would. At last the stoutest of all, whose name was Bartholomew Mendero, imagining that he was going to perform an act of courage, plunged the thumb of his right hand into this putrid limb, which it easily penetrated. This bold action astonished every one to such a degree, that we all run away from him for fear of infection, calling out, ‘ *O abominable ! Carvajal will make you pay dear for this rashness.*’ He went, however, instantly to the brook, which was close to the spot, washed his hand several times, rubbing it over with clay, and so returned home. Next day he came back to school, where he shewed us his thumb, which was swollen prodigiously; but towards evening the whole hand had become inflamed up to the wrist; and next day, which was Tuesday, the arm had swelled up to the elbow, so that he was reduced to the necessity of disclosing the case to his father. Professional men were immediately called in, who had the arm tightly bandaged above the swelling, and applied every remedy which art and experience could suggest as a counter-poison. After all, notwithstanding, it nearly cost the patient his life; and he recovered not without suffering intolerable pain, after having been for four months so enfeebled, as to be incapable of holding the pen.”

From this anecdote it may be concluded how dangerous the putrid emanations from our church-yards must be to the inhabitants of cities. Parish Churches in which so many corpses are interred, become impregnated with an air so corrupted, especially in Spring, when the ground begins to grow warm, that I consider this as one of the chief sources of the small-pox, and of the putrid fevers which are prevalent at that season. An unsavoury smell then issues from it, which makes the stomach rise. I have felt this to an insufferable degree in some of the principal Churches of Paris. This smell is extremely different from that produced by a crowd of living people, for we are affected with no such sensation in the Churches of Convents, where few only are interred.

It would be a curious subject of enquiry to Anatomists, Why the putrefaction of dead bodies should destroy the animal economy of most beings, while it makes no derangement in that of carnivorous animals. Many species of insects and fishes live on carrion. I remark that the greatest part of these have no blood, which is the first fluid that corruption lays hold of, and that the aperture through which they breathe are not the same with those by which they take in their food. But these reasons, it must be allowed, are inapplicable to vultures, ravens, and other birds of prey.

more heterogeneous, and more combined by Man in a state of society, than ever the waves of the Ocean accumulated and confounded on it's shores: there was never found there, however, a single organized body.

It must not be affirmed that the heat necessary to their expansion is there wanting, for it exists in every possible degree, from ice up to fire. Salts crystallize in them, and sulphurs are formed. There was picked up in Paris itself, some years ago, sulphur formed by Nature in ancient dunghills of the time of *Charles IX.* We see every day that fermentation may be excited in dung to such a degree as to catch fire. Nay it's moderate heat is so favourable to the expansion of germs, that it is employed for the hatching of chickens. But the combination of all these substances never produced any thing living or organized. What do I say? The first operations of Nature, which we wish to explain, are covered in so many mysteries, that an egg with an aperture ever so small loses it's prolific power. The slightest contact with the exterior air is sufficient to extinguish in it the radical principles of life. It is neither matter then nor degrees of heat which are wanting to Man, to imitate Nature in the pretended creation of beings; and this power, ever young and active, has by no means wasted itself, as it is always exerting itself in their re-production; a display of Omnipotence equally wonderful with that of conferring existence at the first.

The wisdom with which she has settled their proportions is no less worthy of admiration. On a careful examination of animals, we shall find no one deficient in it's members, regard being had to it's manners and the situation in which it is destined to live. The large and long bill of the toucan, and his tongue formed like a feather, were necessary to a bird who hunts for insects scattered about over the humid sands of the American shores. It was needful that he should be provided at once with a long mattock wherewith to dig, with a large spoon to collect his food, and a tongue fringed with delicate nerves, to enjoy the relish of it. Long legs and a long neck were necessary to the heron, to the crane, to the flamingo, and other birds, which have to walk in marshy places, and to seek their prey under the water. Every animal has feet, and a throat, or a bill, formed in a most wonderful manner, to suit the soil which they have to tread, and the food by which they are to be supported.

From the different configurations of these, Naturalists derive the characters which distinguish beasts of prey from such as live on vegetable substances.

These organs have never been wanting to the necessities of animals, and are themselves indelible as their instincts. I have seen far up in the country ducks propagated at a distance from water, for several generations, which nevertheless retained on their feet the broad membranes of their species, and which, on the approach of rain, clapped their wings, screamed aloud, called upon the clouds, and seemed to complain to Heaven of the injustice of Man, who had banished them from their element. No animal wants any one necessary member, or is encumbered with one that is superfluous. Some philosophers have considered the spurs appended to the heels of the hog as useless, because they do not bear upon the ground ; but this animal, destined to live in swampy places, where he delights to wallow, and to make with his snout deep trenches in the mire, would frequently sink under the impulse of gluttony, had not Nature placed above his heels two prominent excrescences, which assist him in getting out again. The ox, who frequents the marshy banks of rivers, is provided with nearly similar weapons. The hippopotamus, who lives in the water, and upon the banks of the Nile, is furnished with a cloven foot, and above the pastern with two small horny substances, which bend backward as he walks, so that he leaves on the sand an impression which seems to have been made by the pressure of four paws. The description of this amphibious animal may be seen toward the end of *Dampier's Voyages*.

How was it possible for enlightened men to misunderstand the use of these accessory members, the form of which is imitated by some of our country clowns in stilts ; which, from this very resemblance, they call *hogs-feet*, and which they employ in wading through marshy ground ? These same clowns have, in like manner, imitated that of the pointed and divergent spurs of the goat's-foot, which assist them in scrambling over the rocks, in their pikes shod with two iron points ; contrived to prevent the backward motion of loaded carriages on the declivity of mountains.

Nature, who varies her means with the obstacles to be surmounted, has bestowed the appendix excrescences on the heels

of the hog, for the same reason that she has clothed the rhinoceros with a hide rolled up in several folds in the midst of the torrid Zone. This clumsy animal has the appearance of being invested with a three-fold mantle : but being destined to live in the miry morasses of India, where he grubs up with his horny snout the long roots of the bamboo, he would have been in danger of sinking from his enormous weight, had he not been endowed with the strange faculty of extending by inflation the multiplied folds of his skin, and of rendering himself lighter, by occupying a larger space.

What to us appears at first sight a deficiency in certain animals is, you may rest perfectly assured, a wonderful compensation of Providence ; and it would be in many cases an exception from the general Laws of Nature, if she had any other than the utility and happiness of the beings which she has formed. Hence she has given to the elephant a proboscis, which serves him like a hand as he scrambles over the roughest mountains, where he delights to live, in picking up the grass of the field and foliage of the trees, which the thickness and inflexibility of his neck would not permit him otherwise to reach.

She has infinitely varied among the animal creation the means of defence, as well as those of subsistence. It is impossible to suppose that those which move slowly or which scream violently are in a state of habitual suffering : for how could a race of creatures always sickly perpetuate itself, nay, become one of the most universally diffused of the whole Globe ? The sluggard, or sloth, is found in Africa, in Asia, and in America. His tardiness is no more a paralytic affection, than that of the turtle and of the snail. The cries which he utters when you go near him are not the cries of pain. But among animals, some being destined to roam about over the face of the Earth, others to remain fixed on a particular post, their means of defence are varied with their manners. Some elude their enemies by flight ; others repel them by hissings, by hideous figures, by poisonous smells, or by lamentable cries. There are some which deceive the eye, such as the snail, which assumes the colour of the walls, or of the bark of trees, whither he flies for refuge ; others, by a magic altogether inconceivable, transform themselves at pleasure into the colour of surrounding objects, as theameleon.

Oh how sterile is the imagination of Man compared to the intelligence of Nature ! He has produced no one thing, in any line whatever, of which he has not borrowed the model from her Works. Genius itself, about which such a noise is made, this creative genius, which our wits fondly imagine they brought into the world with them, and have brought to perfection in learned circles, or by the assistance of books, is neither less nor more than the art of observing. Man cannot forsake the path of Nature, even when he is determined to go wrong. We are wise only with her wisdom : and we play the fool only in proportion as we attempt to derange her plans.

The graver of *Callot*, so prolific of monsters, never patched up so many frightful demons as the ill-assorted members of different animals, the beak of the owl, the jaws of the crocodile, the body of the horse, the wings of the bat, the fangs and the paws which he has united to the human figure, to render his contrasts more hideous. Our female friends too who sweetly capricious amuse themselves with embroidering fancy-flowers on the various articles of their dress, are reduced to the necessity of borrowing their patterns from the garden. Examine on their gowns and handkerchiefs the sportive productions of their imagination : there you have the flower of the pink on the foliage of the myrtle ; roses on the stalk of the reed ; pomegranates in the place of ears of corn. Nature alone produces only rational harmonies ; and assort in both animals and plants none but parts adapted to the places, to the air, to the elements, to the uses for which she has destined them. Never was a race of monsters beheld issuing from the sublimity of her conceptions.

I have frequently heard living monsters announced for exhibition at our fairs ; but I never had the fortune to see a single one, whatever trouble I might take to that effect. One day a placard was displayed, at the fair of Saint Ovide, “ a cow with three eyes, and a sheep with six feet.” I had a curiosity to see those animals, and to examine into the use which they made of organs and members, to my apprehension entirely superfluous. How, said I to myself, Nature plant six legs under the body of a sheep, when four were amply sufficient to support it ? At the same time I began to recollect that the fly, who is much lighter than the sheep, had six ; and this reflection, I acknowledge, staggered me. But having one day observed a fly which had

alighted on the paper before me, I found she frequently employed herself in alternately brushing her head and wings with the two fore and the two hinder feet. I then evidently perceived that she had occasion for six feet, in order to have the support of four, while the other two were employed to the brushing service, especially on a perpendicular plane. Having caught and examined her by the microscope, I discovered that the two middle feet had no brush, but that the other four had. I farther observed that her body was covered over with particles of dust, which adhere to it in the atmosphere through which she flies; and that her brushes were double, furnished with fine hairs, between which she emitted and drew back at pleasure two claws, similar to those of a cat, but incomparably sharper. These claws enable the fly to lay hold of the most polished surfaces, such as the glass of mirrors, along which you see them march upward and downward without sliding.

I was very curious to see in what manner Nature had attached two new legs to the body of a sheep, and how she had formed, in order to put them in motion, new nerves, new veins, and new muscles, with their insertions. The third eye of the cow perplexed me still more. I had nothing for it then but, like other simpletons, to part with my money for the gratification of my curiosity. The people were coming out in crowds from the repository of those wonders, delighted and astonished with their penny-worth. At last I too had the satisfaction of contemplating the marvellous sight. The two superfluous legs of the sheep were nothing but two shrivelled pieces of skin cut out like thongs, and hanging down from the breast, but without touching the ground, and incapable of being of any use whatever to the poor animal. The pretended third eye of the cow was a kind of oval wound in the middle of the forehead, without orbit, without apple, without a lid, and without any membrane which presented one single organized part of an eye. I withdrew without examining whether these accidents were natural or artificial, for in truth it was not worth the trouble.

The monsters which are preserved in crystal globes filled with spirit of wine, such as pigs with the proboscis of an elephant; children double bodied, or with two heads, which are exhibited in cabinets with a philosophic mysteriousness, prove much less a laboured production of Nature than the interrup-

tion of it. No one of those beings could possibly have attained a complete expansion: and so far from demonstrating that the intelligence which produced them had fallen into a blunder, they attest, on the contrary, the immutability of Supreme Wisdom, which has rejected them from it's plan by refusing them life.

There is a benignity in the conduct of Nature toward Man which challenges the highest admiration: it is this, that in defying him on the one hand to infringe the regularity of her laws, to gratify caprice; on the other she frequently permits him to derange the course of some of them, to relieve his necessities. For instance, she connives at the production of the mule from the copulation of the ass and the mare, because that animal is so serviceable in mountainous countries, but she positively forbids the re-production to proceed, in order to preserve the primitive species, which are of more general utility.

It is easy to discern in most of her works these maternal condescensions, and, may I call them so? royal provisions. They manifest themselves particularly in the productions of the garden. We find them in those of our flowers which have a profusion of *corollæ*, as in the double rose, which is not reproduced by seeds, and which for this reason certain Botanists have dared to brand with the name of monster; though it be the finest of flowers in the estimation of all persons of taste and sensibility. Naturalists pretend that it deviated from the laws of Nature, because it scorned to conform to their Systems: as if the first of laws which governs the World had not for it's object the happiness of Man! But if roses and other flowers which have a superabundance of *corollæ** are monsters, fruits which have a superabundance of pulpy flesh and sugary pastes, of no use toward the expansion of their seeds, such as apples, pears, melons, and fruits which have no seeds at all, as the pineapple, the banana, the bread-fruit, all these must likewise be monsters. The roots which become so plump in our kitchen-gardens, and which are converted into large balls, into succulent glands, into bulbs farinaceous, and of no effect toward the expansion of their stems, must forsooth be all monsters.

* The author means the *petals*, or as they are sometimes called by English writers, "the leaves of the flower."—B. S. B.

Nature feeds the human race in part only with this vegetable superabundance, and bestows it only as the reward of Industry. However fertile the soil may be, the vegetables of the same species with those which are produced in the garden degenerate in the uncultivated plain, grow wild, and spend themselves in foliage and branches. Is it not therefore an instance of wonderful complaisance on the part of Nature that she should transform, under the hand of Man, into pleasant and wholesome aliment, the same juices which would be converted in the forest into lofty stems and tough roots? Were this condescension withheld, in vain would man say to the sap of trees, you shall flow into the fruit, and you shall go no further. To no purpose would he in the most fertile region prune, crop, nip; the almond-tree would refuse to cover it's nut with a fleshy melting pulp, like that of the peach.

Nature from time to time makes Man a present of varieties both useful and agreeable, which she extracts from the same genus. All our fruit-trees come originally from the forest, and no one there re-perpetuates itself in it's species. The pear called Saint-Germain was found in the forest of that name, with it's well-known flavour. Nature culled it, like the other fruits of our orchards, from the table of the animal to serve it up on that of Man; and that it might be impossible for us to doubt respecting her bounty and it's origin, it is her sovereign will that the seeds should re-produce crabs only. Ah! if she were to suspend her particular laws of beneficence in the gardens of our miscreants, in order to establish in them her pretended general laws, what would be their astonishment to find nothing reproduced in their kitchen-gardens and orchards but some miserable wild carrots, pitiful dog-roses, harsh pears, and unsavoury fruits of every sort, such as she produces on the mountains for the coarse palate of the wild boar! They would in truth find stems of trees lofty and vigorous. Their orchards would be doubled in size, and the crops reduced to one half.

The same metamorphosis would take place in the animal of their farm-yards. The hen, which lays eggs much too large in proportion to her size, and for nine months uninterruptedly, contrary to all the laws of incubation among the feathered race, would then fall back into the general order, and would produce at farthest twenty eggs in the course of a year. The hog would

in like manner lose his superfluous fat. The cow, which yields in the rich pastures of Normandy up to twenty-four quarts of milk a day, would give no more than a bare sufficiency to suckle her calf.

To this it is replied, that this profusion of eggs, of fat, and of cream from our domestic animals, is the effect of their copious feeding. But neither does the mare give as much milk as the cow, nor does the duck lay as many eggs as the hen, nor does the ass clothe himself with fat like the hog, though these animals all feed as plentifully the one as the other. Besides the mare, the she-goat, the ewe, the she-ass, have only two teats, whereas the cow has four.

The cow in this respect deviates in a very remarkable manner from the general laws of Nature; who has adjusted in every animal species the number of teats in the mother to that of the young; she, however, is furnished with four paps, though she produces but one calf, and very rarely two; because the two supernumeraries were destined to be nurses to the Human Race. The sow, it is granted, has only twelve teats, though she is intended to bring up sometimes a litter of fifteen or more. Here the proportion seems defective. But if the first has more teats than are requisite to the number of her family, and the second too few for her's, it is because the one is ordained to present Man with the surplus of her milk, and the other with that of her brood. In all countries pork is the poor man's meat, unless religion, as in Turkey, or political considerations, as in the islands of the South Sea, deprive him of the benefits of this gift of Nature. I shall observe with Pliny, that of all flesh it is by far the most savoury. There may be distinguished in it, says he, up to fifty different relishes. It is employed in the kitchens of the rich to give flavour to every species of aliment. In every country, I repeat it, that which is best is always most common.

Is it not passing strange that, when so many plants and animals exhibit proportions so beautiful, adaptations so wonderful to our necessities, and proofs so evident of a Divine Benevolence, we should set about collecting shapeless abortions, pigs with a long proboscis, as if our yards teemed with young elephants, and ceremoniously arrange them in our cabinets, designed to exhibit a display of Nature? Those who preserve

them as invaluable curiosities, and deduce from them consequences and doubts respecting the intelligence of their AUTHOR, do they not discover as much want of taste, and act as unfairly, as one who should go into the workshop of a Founder and pick up the figures which had been accidentally mutilated, the bubblings over of the melting-pot, and the mere metallic moulds which might lie scattered about, and triumphantly display them as a proof of the Artist's blundering ignorance?

The Ancients burnt monsters, the Moderns preserve them in spirit of wine. They resemble those ungracious children who watch their mother in the hope of surprizing her in a fault, that they may arrogate to themselves a right to do what they please. Oh! if the Earth were indeed abandoned to disorder, and that after an infinity of combinations, there should at last appear amidst the monsters which covered it a single body well proportioned and adapted to the necessities of Man, what a source of satisfaction would it be to creatures at once sensible and unhappy, to catch but a glimmering of an INTELLIGENCE somewhere who took an interest in their destiny?

STUDY VII.

REPLIES TO THE OBJECTIONS AGAINST PROVIDENCE, FOUNDED ON THE CALAMITIES OF THE HUMAN RACE.

THE arguments deduced from the varieties of the Human Race, and from the evils accumulated by the hand of Nature, by Governments, and by Religions, on the head of Man, attempt to demonstrate that men have neither the same origin nor any natural superiority above the beasts; that their virtues are destitute of all prospect of reward, and that no Providence watches over their necessities, to supply them.

We shall enquire into those evils, one after another, beginning with such as are imputed to Nature; the necessity and utility of which we shall endeavour to make appear; and shall afterwards demonstrate that political evils are to be ascribed entirely to deviations from the law of Nature, and that they constitute themselves a proof of the existence of a Providence.

Our discussion of this interesting subject shall commence with a reply to the objections founded on the varieties of the human species. We pretend not to deny that there are men black and white, copper-coloured and pale. Some have a beard, others little, if any. But these pretended characters are accidents merely, as has been already shewn. Horses, white, bay or black, with frizzled hair, as those of Tartary, or with sleek smooth hair, as those of Naples, are unquestionably animals of the same species. The *Albinos*, or white negroes, are a species of Lepers; and no more form a particular race of Negroes, than persons with us who have been marked by the small-pox form a race of spotted Europeans.

Though it does not enter into my plan here to detail all the natural adaptations which may be opposed to the accusations of our wretched systems of Physics, and though I have reserved, in the prosecution of this undertaking, some Studies expressly devoted to this object, as far as my poor ability enables me; I shall however by the way observe, that the black colour is a blessing of Providence to the inhabitants of tropical countries. White reflects the rays of the Sun, and black absorbs them.

The first accordingly redoubles his heat, and the second weakens it. Experience demonstrates this in a thousand different ways. Nature has employed, among other means, the opposite effects of these colours for multiplying or weakening on the Earth the heat of the orb of day. The farther you advance toward the South, the blacker are men and animals; and the farther you proceed northward, the whiter is the colour of both the one and the other. Nay, when the Sun withdraws from the northern regions, many animals which were there in Summer, of different colours, begin to whiten; such as squirrels, wolves, hares: and those of the southern regions, to which he is approaching, then clothe themselves with tints deeper and more absorbent; such are, in the feathery race, the *widow*, the cardinal, &c. which exhibit much more brilliant colouring when the Sun approaches the Line, than when he is retiring from it. It is therefore by adaptations of Climate that Nature has made the inhabitants of the Torrid Zone black, as she has whitened those of the Icy Zones. She has given besides another preservative against the heat to the Negroes who inhabit Africa, which is the hottest part of the Globe, principally by reason of that broad belt of sand which crosses it, and whose utility we have already indicated. She has covered the heads of those careless and unindustrious tribes with a fleece more crisp than a tissue of wool, which effectually shelters it from the burning heat of the Sun. They are so perfectly sensible of it's accommodation to this purpose, that they never employ a substitute head-dress; and there is no description of Mankind among whom artificial coverings, as bonnets, turbans, hats, &c. are more rare, than among the Negroes. They use those of foreign nations merely as objects of vanity and luxury, and I do not know of any one that is peculiar to their Nation. The inhabitants of the peninsula of India are as black as they; but their turbans communicate to the hair, which but for their head-dress would perhaps be frizzled, the facility of growing and expanding.

The American tribes which inhabit under the Line are not black, it must be admitted; they are simply copper-coloured. I ascribe this weakening of the black tint to several causes peculiar to their country. The first is, the universal practice of rubbing themselves over with *roucou* (a kind of sweet-scented paste) which preserves the surface of the skin from the too vehement

impression of the Sun. Secondly they inhabit a country clothed with forests, and crossed by the greatest river in the World, which covers it with vapours. Thirdly, their territory rises insensibly from the shores of Brasil, up to the mountains of Peru; which, giving it a greater elevation in the Atmosphere, procures for it likewise a greater degree of coolness. Fourthly, in a word, the East-winds, which blow there incessantly night and day, are always contributing to that coolness.

Finally, the colour of all those nations is so much the effect of Climate, that the descendants of Europeans settled there assume the black tint after the lapse of some generations. This is evidently perceptible in India, in the posterity of the Moguls, tribes derived from the extremity of Asia, whose name signifies *whites*, and who are this day as black as the Nations which they have conquered.

Tallness of stature no more characterizes species, be the genus what it may, than difference of colour. A dwarf and a large apple-tree proceed from the same grafts. Nature however has rendered it invariable in the Human Species alone, because variety of magnitude would have destroyed, in the physical order, the proportions of Man with the universality of her productions, and because it would have involved in the moral order consequences still more dangerous, by subjecting beyond recovery the smaller species of mankind to the greater.

There are no races of dwarfs nor of giants. Those who are exhibited at fairs are little men contracted, or tall over-grown fellows, without proportion and without vigour. They reproduce not themselves either in miniature or magnitude, whatever pains may have been taken by certain Princes to procure a distinct propagation; among others by the late King of Prussia, Frederick II. Besides, Do sufficient varieties of proportion of the Human Species issue from the hand of Nature to merit the distinctive appellations of dwarfs and giants? Is there between any two of them so great a difference as between a little Sardinian poney and a huge Brabant horse; as between a common spaniel and one of the large Danish dogs which run before our coaches?

All nations have been from the beginning, and still are, with very little difference and very few exceptions, of the same stature. I have seen Egyptian Mummies, and the bodies of the

*Guanches** of the Canary islands wrapped up in their skins. I have seen in Malta, in a tomb hewn out of the solid rock, the skeleton of a Carthaginian, all the bones of which were violet-coloured, and which had perhaps lain there from the days of Queen Dido. All these bodies were of the common size. Enlightened and sober-minded Travellers have reduced to a stature hardly exceeding our own the pretended gigantic form of the Patagonians.† I am aware that I have elsewhere alleged these same reasons; but it is impossible to repeat them too frequently, because they overturn beyond the possibility of contradiction the pretended influences of Climate, which are become the principles of our Physics, and what is still worse, of our Morality.

There were formerly, we are told, real giants. The thing is possible; but this truth is become to us inconceivable, like all others of which Nature no longer furnishes any testimony. If

* GUANCHES are the skeletons covered with the skin of the original inhabitants of the Canary Islands. The body of the Guancho was deposited in a cavity adapted to it's size, hewn out of the rock. The stone being of a porous nature, the animal juices were absorbed or filtered through, and the solid parts with their natural skinny mantle became indurated by a process of natural embalming, to such a degree as to resist the future assaults of time. They are still exhibited by the natives of those islands to strangers who visit them, with emotions of pride and veneration; as the images of their illustrious ancestors were ostentatiously displayed by the Patrician families of Rome. Avarice has, however, infected the Canaries, as well as more enlightened islands; and families have been prevailed on to part with their *Guanches* to the Museums of European Collectors of Curiosities, for a little ready money, or in consideration of a large order of wines.

—Quid non mortalia pectora cogis,
Auri sacra fames!

in plain English, *The love of money will make a man sell his father.*—H. H.

† On the subject of the Patagonians, the reader may peruse, with much satisfaction, a paper by my late excellent friend Mr. Thomas Pennant, the great British naturalist of our times. Mr. Falkner, “an ancient Jesuit, who had passed thirty-eight years of his life in the southern part of South-America, between the river La Plata and the straits of Magellan,” communicated to Mr. Pennant the most interesting portion of information contained in this paper. The remarks which Falkner made on the size of the Patagonians, were as follows: “that the tallest, which he measured in the same manner that Mr. Byron did, was seven feet eight inches high; that the common height or middle size, was six feet; that there were numbers that were even shorter; and that the tallest women did not exceed six feet.” Thus it appears, that Saint-Pierre’s observation is correct.—B. S. B.

Polyphemuses lofty as a tower ever existed, every step they took in walking must in most soils have sunk into the ground. How could their long and clumsy fingers have milked the little she-goats, reaped the corn, mowed down the grass, picked the fruits of the orchard? The greatest part of our aliments would escape their eyes as well as their hands.

On the other hand, had there been generations of pigmies, how could they have levelled the forests to make way for the cultivation of the earth? They would have lost themselves among the rushes. Every brook would have been to them a river, and every pebble a rock. The birds of prey would have carried them off in their talons, unless they made war on their eggs, as *Homer* represents his pigmy race engaged in war with the eggs of cranes.

On either of these suppositions all the relations of natural order are burst asunder, and such discords necessarily involve the utter destruction of all social order. Suppose a nation of giants to exist possessed of our industry, and instigated by our ferocious passions: let us place at the head of it a *Tamerlane*, and see what would become of our fortifications and of our armies before their artillery and their bayonets.

As much as Nature has affected variety in the species of Animals of the same genus, though they were destined to inhabit the same regions, and to subsist on the same aliments, so much has she studied uniformity in the production of the Human Species, notwithstanding the difference of Climates and of food. The accidental prolongation of the coccyx in some human individuals has been mistaken for a natural character, and a new species of men with tails has been grafted on a principle so flimsy. Man may degrade himself to the level of the beast by the indulgence of brutal appetite; but never was his noble form dishonoured by the tail, the forked feet, and the horns of the brute. In vain is the attempt made to trace an approximation of Man toward the class of mere animals by insensible transitions.

Were there in truth any of the human race in animal forms, or any animal endowed with human reason, they would be publicly exhibited. We should have them all over Europe, especially in times like these, when the whole Globe is pervaded and ransacked by so many enlightened Travellers; and when, I do not say Princes, but puppet-players import alive in our fairs the-

zebra so wild, the elephant so lumpish, tigers, lions, white bears, nay up to crocodiles ; which have all been presented to public inspection in London.

Vain is the attempt to establish analogies between the she orang-outang, from the situation and configuration of the bosom, from the periodical sexual purgations, from the attitude, and even from the appearance of modesty. Though the female orang-outang passes her life in the woods, *Allegrain* surely, as has been observed, never could have modelled after her his statue of Diana which is shewn at Lucienne. There is a much greater difference still between the Reason of Man and that of beasts, than there is between their forms ; and that man's understanding must have been strangely perverted who could advance, as a celebrated Author has done, that there is a greater distance between the understanding of *Newton* and that of such or such a man, than between the understanding of that man and the instinct of an animal. As we have already said, the dullest of Mankind can learn the use of fire, and the practice of agriculture, of which the most intelligent of animals is absolutely incapable ; but what I have not yet said, the simple use of fire and the practice of agriculture are far preferable to all *Newton's* discoveries.

Agriculture is the art of Nature, and fire is her primary agent. From experience we are assured that men have acquired by means of this element and of this art a plenitude of intelligence, of which all their other combinations, I venture to affirm, are merely consequences. Our Sciences and Arts are derived for the greatest part from these two sources, and they do not constitute a difference more real between the understanding of one man and another, than there is between the dress and furniture of Europeans and those of Savages. As they are perfectly adapted to the necessities of the one and the other, they establish no real difference between the understandings which contrived them. The importance which we assign to our talents proceeds not from their utility but from our pride. We should take a material step towards it's humiliation, did we consider that the animals which have no skill in agriculture, and know not the use of fire, attain to the greatest part of the objects of our Arts and Sciences, and even surpass them.

I say nothing of those which build, which spin, which manufacture paper, cloth, hives, and which practise a multitude of other trades of which we have no knowledge. But the torpedo defended himself from his enemies by means of the electric shock, before Academies thought of making experiments in electricity; and the limpet understood the power of the pressure of the air, and attached itself to the rocks, by forming the vacuum with it's pyramidical shell, long before the air-pump was set a going. The quails which annually take their departure from Europe on their way to Africa have such a perfect knowledge of the autumnal Equinox, that the day of their arrival in Malta, where they rest for twenty-four hours, is marked on the almanacks of that island about the 22d of September, and varies every year as the Equinox. The swan and wild duck have an accurate knowledge of the Latitude where they ought to stop, when every year they re-ascend in Spring to the extremities of the North, and they can find out without the help of compass or octant the spot where the year before they made their nests. The frigate which flies from East to West between the Tropics, over vast Oceans interrupted by no Land, and which regains at night at the distance of many hundred leagues the rock hardly emerging out of the water which he left in the morning, possesses means of ascertaining his Longitude hitherto unknown to our most ingenious Astronomers.

Man, it has been said, owes his intelligence to his hands: but the monkey, the declared enemy of all industry, has hands too. The sluggard or sloth likewise has hands, and they ought to have suggested to him the propriety of fortifying himself: of digging at least a retreat in the earth for himself and for his posterity, exposed as they are to a thousand accidents by the slowness of their progression. There are animals in abundance furnished with tools much more ingenious than hands, and which are not for all that a whit more intelligent. The gnat is furnished with a proboscis, which is at once an awl proper for piercing the flesh of animals, and a pump by which it sucks out their blood. This proboscis contains besides a long saw, with which it opens the small blood vessels at the bottom of the wound which it has made. He is likewise provided with wings to transport him wherever he pleases; a corslet of eyes studded round his little head, to see all the objects about him in

every direction; talons so sharp, that he can walk on polished glass in a perpendicular direction; feet supplied with brushes for cleansing himself; a plume of feathers on his forehead; and an instrument answering the purpose of a trumpet to proclaim his triumphs. He is an inhabitant of the Air, the Earth, and the Water, where he is born in form of a worm, and where before he expires the eggs which are to produce a future generation are deposited.

With all these advantages he frequently falls a prey to insects smaller and of a much inferior organization. The ant which creeps only, and is furnished with no weapon except pincers, is formidable not to him only but to animals of a much larger size, and even to quadrupeds. She knows what the united force of a multitude is capable of effecting; she forms republics: she lays up store of provisions; she builds subterraneous cities; she forms her attacks in regular military array; she advances in columns, and sometimes constrains Man himself in hot countries to surrender his habitation to her.

So far is the intelligence of any one animal from depending on the structure of it's limbs, that their perfection is frequently on the contrary in the inverse ratio of it's sagacity, and appears to be a kind compensation of Nature to make up a defect. To ascribe the intelligence of Man to his hands, is to deduce the cause from the means, and talent from the tool with which it works. It is just as if I were to say that *Le Sueur* is indebted for the happy native graces of his pictures to a pencil of sable's hair; and that *Virgil* owes all the harmony of his verses to a feather of the swan of Mantua.

It is still more extravagant to maintain that human reason depends on Climate, because there are some shades of variety in manners and customs. The Turks cover their heads with Turbans, and we cover ours with hats; they wear long flowing robes, and we dress in coats with short skirts. In Portugal, says *Montagne*, they drink off the sediment of wines, we throw it away. Other examples which I could quote are of similar importance. To all this I answer, that we would act as these people if we were in their country; and that they would act as we do were they in ours.

Turbans and flowing robes are adapted to hot countries, where the head and body stand in need of being cooled, by in-

closing in the covering of both a greater mass of air. From this necessity has arisen the use of turbans among the Turks, the Persians, and Indians, of the mitres of the Arabians, of the bonnets like a sugar-loaf of the Chinese and Siamese, and that of wide and flowing robes worn by most of the Nations of the South. From a contrary necessity the Nations of the North, as the Polanders, the Russians, the Tartars, wear furred caps and close garments. We are obliged to have in our rainy Climates three aqueducts upon our head, and garments shortened, because of the dirt. The Portuguese drink the sediment of wine; and so would we do with the wines of Portugal; for in sweet wines, as those of hot countries, the most sugary particles are at the bottom of the cask; and in ours, which are sprightly, nothing is at the bottom but mere dregs, the best is uppermost. I have seen in Poland, where they drink great quantities of the wines of Hungary, the bottom of the bottle presented as a mark of preference. Thus the very varieties of national customs prove the consistency of human reason.

Climate has no greater influence in changing human morality, which is reason in perfection. I admit at the same time that extreme heat and cold produce an effect on the passions. I have even remarked that the hottest days of Summer and the coldest of Winter were actually the seasons of the year when most crimes were committed. The dog-days, say the vulgar, is a season of calamity. I could say as much of the month of January. I believe it must have been in conformity to these observations that ancient Legislators had established, for that critical period, festivals designed to dissipate the melancholy of Mankind, such as the feast of Saturn among the Romans, and the feast of Kings* among the Gauls. In each Nation the festival was adapted to the public taste; among the Romans it presented the images of a republic; among our ancestors those of monarchy.

*The *Feast of Kings*, I apprehend, is coeval with the Christian Era, and had it's origin in the star-directed visit of the Eastern Magi to Bethlehem of Judah, recorded in the beginning of the second chapter of the Gospel according to St. Matthew. We can hardly suppose the ancient Gauls so extremely attached to irregular and unsteady Monarchy, as to institute and celebrate annual feasts in honour of it. Whatever may be in this, modern Gauls can say of the political body what the *Médecin malgré lui* of *Moliere* says respecting the natural body: *We have changed all that.*—H. H.

But I beg leave likewise to remark that those seasons fertile in crimes, are the seasons too of the most splendid actions. The effervescence of season acts on our senses like that of wine. It produces in us an extraordinary impulsion, but indifferently to good and to evil. Besides Nature has implanted in our soul two powers, which ever balance each other in just proportion. When the physical sense, Love, debases us, the moral sentiment, Ambition, raises us up again. The equilibrium necessary to the empire of Virtue still subsists, and it is never totally lost, except in persons with whom it has been destroyed by the habits of society, and more frequently still by those of education. In that case the predominant passion having no longer any counterpoise, assumes the command of all our faculties; but this is the fault of society, which undergoes the punishment of it, and not that of Nature.

I remark however that these same seasons exert their influence on the passions of Man, by acting only on his moral and not on his physical principle. Though this reflection has something of the air of paradox, I shall endeavour to support it by a very remarkable observation. If the heat of Climate could act on the human body, it assuredly would be when the fetus is in the womb: for it then acts on that of all animals, whose expansion it accelerates. Father *du Tertre*, in his excellent History of the Antilles, says, that in those islands the period of gestation of all European animals is shorter than in temperate Climates; and that the hen's eggs are not longer in hatching than the seed of the orange in bursting their shell, twenty-three days. Pliny had observed that in Italy they hatch in nineteen days in Summer, and in twenty-five in Winter.

In every country the temperature of Climate hastens or retards the expansion of all plants and the gestation of all animals. the Human Race excepted; let this be carefully remarked. "In the Antilles' islands," says Father *du Tertre*, "the white women and the negresses go with child nine months, as in France." I have made the same remark in all the countries through which I have travelled, in the Isle of France, under the Tropic of Capricorn, and in the extremity of Russian Finland. This observation is of considerable importance. It demonstrates that the body of Man is not subjected in this respect to the same laws with other animals. It manifests a moral

intention in Nature to preserve an equilibrium in the population of Nations, which would have been deranged had the pregnancy of the woman been of shorter duration in hot countries than in cold. This intention is farther manifested in the admirable proportion she maintains in the production of the two sexes, so nearly equal in number, and in the very difference which we find of one country from another between the number of males and females : for it is compensated from North to South in such a manner, that if there be rather more women born to the South there are rather more men born to the North ; as if Nature meant to attract and unite Nations the most remote from each other by means of intermarriages.

Climate has an influence on morality, but by no means determines it ; and though this supposed determination may be considered in many modern Books as the fundamental basis of the Legislation of the Nations, there is no one philosophical opinion more completely refuted by historic testimony. “ Liberty,” say they, “ has found her asylum in the lofty mountains ; from the North it was that the haughty conquerors of the World issued forth. In the southern plains of Asia, on the contrary, reign despotism, slavery, and all the political and moral vices which may be traced up to the loss of liberty.”

It seems then we must go and regulate by our barometers and thermometers the virtues and the happiness of Nations ! There is no necessity to leave Europe in order to find a multitude of monarchical mountains, such as those of Savoy, a part of the Alps, of the Appenines, and the whole of the Pyreneans. We shall see on the contrary many republics in plains, such as those of Holland, of Venice, of Poland, and even of England. Besides, each of those territories has by turns made trial of different sorts of government. Neither cold nor ruggedness of soil inspire men with the energy of liberty, and still less with the unjust ambition of encroaching on that of others. The peasants of Russia, of Poland, and of the cold mountains of Bohemia, have been slaves for many ages past ; whereas the Angrias and the Marattahs are free men and tyrants in the South of India. There are several republics on the northern coast of Africa where it is excessively hot. The Turks, who have laid hold of the finest provinces of Europe, issued from the mild Climate of Asia. The timidity of the Siamese and of

most Asiatics has been quoted ; but it is to be imputed in those Nations to the multitude of their tyrants rather than to the heat of their countries. The Macassars, who inhabit the island of Célèbes situated almost under the Line, are possessed of a courage so intrepid, as the gallant Count *Forbin* relates, that a small number of them armed with poniards only, put to flight the whole force under his command at Bancoek, consisting of Siamese and French, though the former were very numerous, and the others armed with muskets and bayonets.

If from courage we make the transition to love, we shall find that Climate has no more a determining power over Man in the one case than in the other. I might refer myself for proof of the excesses of this passion to the testimony of travellers, to ascertain which has the superiority in this respect, the Nations of the South or those of the North. In all countries love is a torrid zone to the heart of Man. I must observe that these appropriations of Love to the Nations of the South, and of Courage to the Nations of the North, have been imagined by our Philosophers as effects of Climate applicable only to foreign nations : for they unite these two qualities, as effects of the same temperament, in those of our heroes to whom they mean to pay their court. According to them, a Frenchman great in feats of love is likewise great in feats of war ; but this does not hold as to other Nations. An Asiatic with his seraglio is an effeminate coward ; and a Russian, or any other soldier of the North, whose Courts give pensions, is a second Mars. But all these distinctions of temperament, founded on Climate and so injurious to Mankind, vanish into air before this simple question ; Are the turtle-doves of Russia less amorous than those of Asia ; and are the tigers of Asia less ferocious than the white bears of Nova Zembla ?

Without going to seek among men objects of comparison and contrast from difference of place, we shall find great diversity in manners, in opinions, in habiliments, nay in physiognomy, between an opera-actor and a capuchin-friar, than there is between a Swede and a Chinese. What a contrast is the talkative, flattering deceitful Greek, so fondly attached to life, to the silent, stately, honest Turk, ever devoted to death ! These men, so very opposite, are born however in the same cities, breathe the same air, live on the same food. Their extraction, we shall be told,

is not the same ; for pride among us ascribes a mighty influence to the power of blood. But the greatest part of those Janissaries, so formidable to the cowardly Greeks, are frequently their own children, whom they are obliged to give in tribute, and who pass by a regular process in this first corps of the Ottoman soldiery. The courtezans of India so voluptuous, and it's penitents so austere, are they not of the same Nation, and in many cases of the same family ?

I beg leave to ask, in what instance was an inclination to vice or virtue known to be communicated with the blood ? *Pompey*, so noted for his generosity, was the son of *Strabo*, infamously notorious to the Roman people for his avarice. The cruel *Domitian* was brother to the gracious *Titus*. *Caligula* and *Agrippina*, the mother of *Nero*, were indeed brother and sister ; but they were the children of *Germanicus*, the darling hope of Rome. The barbarous *Commodus*, was son to the divine *Marcus Aurelius*. What a difference is frequently observable in the same man between his youth and his mature age ; between *Nero*, saluted as the Father of his country when he mounted the throne ; and *Nero*, execrated as it's avowed enemy before his death : between *Titus*, stigmatized with the name of a second *Nero* in his youth, and *Titus* at his death, embalmed with the tears of the Senate of the Roman people and of strangers ; and transmitted unanimously to posterity as the delight of mankind ?

It is not Climate then which regulates the morality of Man ; it is opinion, it is education ; and such is their power, that they triumph not only over latitudes, but even over temperament. *Cesar*, so ambitious, so dissolute ; and *Cato*, so temperate and virtuous, were both of a sickly constitution. Place, Climate, Nation, Family, Temperament, no one of these, and in no part of the World, determine men to vice or to virtue. They are every where free to choose.

Before we take into consideration the evils which men bring upon themselves, let us attend to those which are inflicted by the hand of Nature. It is demanded, Why should beasts of prey exist ? They are absolutely necessary. But for them the Earth would be infested with cadaverous substances. There perishes annually of a natural death the twentieth part at least of quadrupeds, the tenth part of fowls, and an infinite number of insects, most of the species of which live only one year.

Nay, there are insects whose life is contracted to a few hours, such as the ephemera.

As the rains convey all these spoils of the land to the rivers, and thence to the Seas, it is accordingly on their shores that Nature has collected the animals which are destined to consume them. Most of the ferocious animals descend by night from the mountains, to hunt for their prey in this direction; there are even several classes created expressly for such situations; as the whole amphibious race; for example, the white bear, the otter, the crocodile. It is in hot countries especially, where the effects of corruption are most rapid and most dangerous, that Nature has multiplied carnivorous animals. Tribes of lions, tigers, leopards, panthers, civet-cats, ounces, jackals, hyenas, condors, &c. resort thither to reinforce those of wolves, foxes, martens, otters, vultures, crows, &c. Legions of voracious crabs are nestled in their sands; the caimans and the crocodiles lie in ambush among their reeds; shell-fish of innumerable species armed with utensils fit for sucking, piercing, filing, bruising, roughen the face of the rocks and pave the borders of their seas; clouds of sea-fowls hover with a loud noise over their shallows, or sail round and round at the discretion of the waves in quest of food; the lamprey, the becune, the carang, and the whole species of cartilaginous fishes, which live only on flesh, such as the hygian, the long shark, the broad thorn-back, the slipper, the polypus, armed with air holes, and all the varieties of sea-dogs, swim there in crowds, constantly employed in devouring the wreck of bodies thrown upon the shore.

Nature calls in besides the insect legions to hasten forward their consumption. The wasps, furnished with scissars, cut asunder the fleshy parts; the flies pump out the fluids, the sea-worms cut in pieces the bones. These last on the southern coasts, and especially at the mouths of rivers, are in such prodigious quantities, and armed with augurs so formidable, that they are capable of devouring a ship of war in less time than it cost to build her; and have thereby reduced the maritime Powers to the necessity of lately sheathing the bottoms of their squadrons with copper, as a security against their attacks.

The wrecks of all those bodies, after having served for food to the innumerable tribes of other fishes, some of which are

provided with beaks formed like a spoon, and others like a pipe, for picking up the very crumbs of this vast table; reduced at length, through such a series of digestions, into phlegms, into oils, into bitumens, and united to the pulps of vegetables, which descend from all quarters into the Ocean, would re-produce in it's waters a new chaos of putrefaction, did not the currents convey their dissolution to volcanos, whose fires finish the process of decomposition, and give them back to the elements. For this reason it is, as has been already indicated, that volcanos are frequent only in hot countries; that they are all situated in the vicinity of the Sea or of great Lakes; that they are disposed at the extremity of their currents; and that they owe entirely to the purification of the waters, the sulphurs and the bitumens which administer a constant supply to their furnaces.

Animals of prey are by no means an object of terror to Man. First, because most of them roam abroad only in the night. They have prominent characters, which announce their approach even before it is possible to perceive them. Some savour strongly of musk, as the marten, the civet-cat, the crocodile; others have shrill and piercing voices, which may be heard by night at a great distance, as wolves and jackals; others are distinguished by party-coloured spots or streaks, which are perceptible a great way off on the yellow ground of their skin; such are the dusky stripes of the tiger and the dark spots of the leopard. All of them have eyes which sparkle in the dark. Nature has bestowed some of these common signatures even on carnivorous and blood-sucking insects; such is the wasp, whose ground colour is yellow, surrounded with rings of black like the tiger, and the gnat, spotted with white upon a dark ground, who announces his approach by a loud buzzing. Even those which attack the human body are furnished with remarkable indications. They either smell strongly, as the bug; or present oppositions of colour to the places on which they fix, as white insects on the hair; or the blackness of the flea contrasted to the whiteness of the skin.

A great many Writers exclaim violently on the cruelty of ferocious animals, as if our cities were liable to be invaded by swarms of wolves, or as if bands of lions from Africa were from time to time making incursions into our European colonies. They all shun the habitations of Man, and, as I said, most of

them stir abroad only in the night. These distinctive characters are unanimously attested by Naturalists, Hunters, and Travelers. When I was at the Cape of Good Hope, *M. de Tolback*, who was then Governor, informed me that lions were formerly very common in the adjacent country; but that since the Dutch had formed a settlement there, you must travel fifty or sixty leagues up the country before one is to be seen.

After all what is their ferocity to us? Even supposing we were not provided with arms, which they are incapable of resisting, and with a sagacity far superior to all their cunning, Nature has given us dogs able to combat, nay to subdue them; and she has most admirably adapted their species to those of animals the most formidable. In the countries where lions are natives, there is likewise produced a breed of dogs capable of engaging them in single combat. I shall quote, after the ancient but learned translation of *Dupinet*, what Pliny relates of a dog of this species, which was presented to Alexander by a King of Albania.* “King Alexander first opposed to him a lion. “which the dog presently tore in pieces. After that he ordered to let loose an elephant, which afforded him the highest diversion that he ever had enjoyed. For the dog bristling himself up from the first, began to wheel about and snarl at the elephant; then advanced to the attack, springing on this side and on that side, with all imaginable circumspection: now leaping up to assault, now couching to the right, to the left, which caused the elephant to turn and wind about so frequently that he was at last completely tired out, and fell down with a shock which made the ground tremble, on which the dog sprung upon him and dispatched him.” I can hardly think this animal could be of the same race with our lap-dogs.

The animals formidable to Man are more to be feared from their smallness than from their magnitude; there is no one however but what may be rendered subservient to his benefit. Serpents, centipeds, scorpions, toads, inhabit scarcely any other than humid and unwholesome places, from which they keep us at a distance, more by their hideous figures than by their poisons. Such serpents as are really dangerous give signals of their approach; such are the rattles of the snake which bears that name.

* Pliny's Natural History, book viii. chap. xl.

Few persons perish by their sting, and only from their own carelessness and imprudence. Besides our pigs and poultry eat them currently without suffering the slightest inconvenience. Ducks in particular devour them with avidity, as they likewise do most poisonous plants. Those of the kingdom of Pontus acquired so much virtue by aliments of such sorts as are common there, that Mithridates employed their blood in his famous counter-poisons.

There are, it is admitted, noxious insects which prey upon our fruits, our corn, nay our persons. But if snails, may-bugs, caterpillars, and locusts ravage our plains, it is because we destroy the birds of our groves which live upon them; or because that on transporting the trees of foreign countries into our own, such as the great chesnut of India, the ebony, and others, we have transported with them the eggs of those insects which they nourish, without importing likewise the birds of the same climate which destroy them. Every country has those peculiar to itself, for the preservation of it's plants. I have seen one at the Cape of Good Hope, called the gardener's bird, incessantly employed in catching the worms and caterpillars, which he stuck on the thorny prickles of the bushes. I have likewise seen in the Isle of France a species of starling called Martin, which comes from India, and which lives entirely on locusts and on other insects which infest the cattle. If we were to naturalize these birds in Europe, no scientific discovery ever made would be so beneficial to Man.

But the birds of our own groves are still sufficient to clear our plains of noxious vermin, provided the bird-catchers were laid under a prohibition to entrap them as they do by whole coveys in their nets, not to immure them in cages, but to make food of them. A fancy was adopted some years ago in Prussia to exterminate the race of sparrows, as inimical to agriculture. Every peasant in the country was subjected to an annual capitation tax of twelve heads of that kind of bird, which were employed in the manufacture of salt-petre, for in that country nothing is suffered to go to waste. At the end of the second, or at farthest the third year, it was discovered that insects had devoured their crops, and it was speedily found advisable to invite the sparrows from neighbouring countries to re-people the kingdom with them. These birds, it is true, do eat some grains of corn

when the insects fail them; but these last, among others the weevil, consume the grain by bushels, nay by whole granaries. If however it were possible to extinguish the whole race of insects, it would be the height of imprudence to set about it; for we should destroy along with them most of the feathered tribes of our plains, which have no other food for their young while in the nest.*

As to the animals which fall upon our corn in the granary and our woollens in the warehouse, such as rats, mice, mites, moths; I find that the former are useful in purifying the earth from human excrement, which constitutes a considerable part of their food. Besides, Nature has made Man a present of the cat, to clear the interior of his habitation from those vermin. She has endowed this animal not only with uncommon agility, and with wonderful patience and sagacity, but also with a spirit of domesticity perfectly adapted to her employment. The cat attaches herself solely to the house. If the master removes, she returns alone at night to her old habitation. She differs essentially in this from the dog, who attaches himself solely to the

* For some observations on the utility of birds, of different orders or families, in destroying various species of pernicious insects, I beg leave to refer the reader to my *Fragments of the Natural History of Pennsylvania*, Part I. Philadelphia, 1799. The following fact, which will not, I hope, be deemed an uninteresting one, is copied from that work. "As a devourer of pernicious insects, one of the most useful birds with which I am acquainted, is the House-Wren, or *certhia familiaris*. This little bird seems peculiarly fond of the society of man, and it must be confessed, that it is often protected by his interested care. From observing the usefulness of this bird in destroying insects, it has long been a custom, in many parts of our country, to fix a small box at the end of a long pole in gardens, about houses, &c., as a place for it to build in. In these boxes they build and hatch their young. When the young are hatched, the parent birds feed them with a variety of different insects, particularly such as are injurious in gardens. One of my friends was at the trouble to observe the number of times that a pair of these birds came from their box, and returned with insects for their young. He found that they did this from forty to sixty times in an hour; and in one particular hour the birds carried food to their young seventy-one times. In this business they were engaged the greater part of the day, say twelve hours. Taking the medium, therefore, of fifty times an hour, it appeared that a single pair of these birds took from the cabbage, salad, beans, peas, and other vegetables in the garden, at least six hundred insects in the course of one day. This calculation proceeds upon the supposition, that the two birds took each, only a single insect each time. But it is highly probable, they often took several at a time."—B. S. B.

person of his master. The cat has the affection of a courtier, and the dog that of a friend; the former adheres to the possession, and the latter to the man.

The weevil and the moth sometimes commit, it is true, great depredations among our grain and our woollens. Some Writers have told us that the common hen is sufficient to clear the granaries of them: possibly it may be so. We have besides the spider and the swallow, which destroy them at the season when they take wing. I shall here consider only their political utility. On looking into those prodigious magazines where monopolizers hoard up the provision and clothing of a whole province, are we not bound to bless the Hand that created the insect which obliges them to bring these necessary commodities to market? Were grain as incorruptible as gold and silver, it would soon become as scarce. See under how many locks and doors these metals are secured, The commonalty would at length be completely deprived of their subsistence, if it were as little susceptible of change as that which is the representative of it. The mite and the moth first lay the miser under the necessity of employing a good many hands in stirring about and sifting his grain, till they force him at last to dispose of it altogether. How many poor wretches would go naked if the moth did not devour the wardrobes and warehouses of the rich! What is most wonderful here is, that the articles which minister to luxury are not liable to perish by insects, as those which are subservient to the most pressing wants of human life. It is possible to preserve without any diminution of value, coffee, silk and cotton, even for ages; but in India, where these commodities are real necessities of life, there are insects which quickly corrode them, particularly cotton stuffs.

The insects which attack the human body equally oblige the rich to employ those who have nothing, as domestics, to keep up cleanliness around them. The Incas of Peru exacted even this tribute of the poor: for in all countries these insects attach themselves to Man, though it may have been said that they did not pass the line. Besides these insects are rather teasing than noxious: they draw off the bad blood. As they immoderately increase only in great heats, they invite us to have recourse to bathing, which is so wholesome, and yet so

much neglected among us, because being expensive, it is become an object of luxury.

After all, Nature has placed other insects near us which destroy them; these are the spiders.* I have heard of an old officer who being very much incommoded with bugs at the Hospital of the Invalids, permitted the spiders to multiply round his bed, and thereby got the better of that nauseous vermin. This remedy, I am aware, will appear to many persons worse than the disease. But I believe it possible to find others more agreeable in perfumes and oily essences; at least I have remarked that the odour of various kinds of aromatic plants put to flight those abominable animals.

As to other calamities of Nature's inflicting, Man feels their pressure only because he deviates from her laws. If storms sometimes ravage his orchards and his corn fields, it is because he frequently places them where Nature never intended they should grow. Storms scarcely ever injure any culture except the injudicious cultivation of Man. Forests and natural meadows never suffer in the slightest degree. Besides, they have their utility. Thunder-storms purify and cool the air. The hail with which they are sometimes accompanied destroys great quantities of hurtful insects; and hails are frequent only at the season when such insects hatch and multiply; in Spring and Summer. But for the hurricanes of the Torrid Zone, the ants

* I presume that it is a particular species of spider: for I am persuaded that there are as many species of these as there are of insects to be destroyed. They do not all expand nets; some catch their prey fairly in the chace; others succeed by lying in ambuscade. I have seen one in Malta of a very singular character, and which is to be found in every house of that island. Nature has bestowed on this species of spider the resemblance of a fly, in the head and fore part of the body. When she perceives a fly on the wall, she makes her first approaches in great haste, taking care always to maintain the higher station. When she has got within five or six inches of her object she advances very slowly, presenting to it a treacherous semblance; and when she has got within the distance of two or three inches, she makes a sudden spring on her prey. This violent leap, made on a perpendicular plane, must surely precipitate her to the ground. No such thing. You find her again still on the wall, whether she has made good her blow or missed it; for previously to this great effort, she had affixed a cord a-top, by which to warp herself up again. Cartesian Philosophers, will you pretend after this to persist in maintaining that animals are merely machines!

and locusts would render the islands situated between the Tropics totally uninhabitable.

I have already pointed out the utility, the absolute necessity of the volcanos, whose fires purify the waters of the Sea, as those of the thunder purify the air. Earthquakes proceed from the same cause. Besides, Nature communicates previous notice of their effects, and of the places where their focusses are situated. The inhabitants of Lisbon know well that their city has been several times shattered by shocks of this kind, and that it is imprudent to build in stone. To persons who can submit to live in a house of wood they have nothing formidable. Naples and Portici are perfectly acquainted with the fate of Herculaneum. After all, earthquakes are not universal; they are local and periodical. Pliny has observed the Gauls were not subject to visitations of this kind; but there are many other countries which know of them only by report. They are scarcely ever felt except in the vicinity of volcanos, on the shores of the Sea or of great Lakes, and only at certain particular portions of the shore.

As to the epidemical maladies of the Human Race and the diseases of animals, they are in general to be imputed to corrupted waters. Physicians who have investigated their causes, ascribe them sometimes to the corruption of the air, sometimes to the mildew of plants, sometimes to fogs: but all these causes are simply effects of the corruption of the waters, from which arise putrid exhalations that infect the air, and vegetables, and animals. This may be charged in almost every instance on the injudicious labours of Man. The most unwholesome regions of the Earth, as far as I am at present able to recollect, are in Asia, on the banks of the Ganges, from which proceed every year putrid fevers, that in 1771 cost Bengal the life of more than a million of men. They have for their focus the rice plantations, which are artificial morasses formed along the Ganges for the culture of that grain. After the crop is reaped, the roots and stalks of that plant which remain on the ground, rot, and are transformed into infectious puddles, from which pestilential vapours are exhaled. It is in the view of preventing these pernicious consequences that the culture of this plant has been expressly prohibited in many parts of Europe, espe-

cially in Russia, round Otchakof, where it was formerly produced in great quantities.

In Africa the air of the island of Madagascar is corrupted, and from the same cause, during six months of the year, and will ever present an invincible object to any European settlement upon it. All the French colonies which have been planted there perished one after another from the putridity of the air; and I myself must with the rest have fallen a victim to it, had not Divine Providence, by means of which I could have no foresight, prevented my intended expedition and residence in that part of the world.

It is from the ancient miry canals of Egypt that the leprosy and the pestilence are perpetually issuing forth. In Europe, the ancient salt-marshes of Brouage, which the water of the Sea no longer reaches, and in which the rain-waters stagnate, because they are confined by the dikes and ditches of the old salt-pits, are become constant sources of distemper among the cattle. Similar diseases, putrid and bilious fevers, and the land-scurvy, annually issue from the canals of Holland, which putrefy in Summer to such a degree, that I have seen in Amsterdam the canals covered with dead fishes; and it was impossible to cross certain streets without obstructing the passages of the mouth and nose with your handkerchief. They have indeed forced a kind of current to the stagnant waters by means of wind-mills, which pump them up and throw them over the dikes in places where the canals are lower than the level of the Sea; but these machines are still far too few in number.

The bad air of Rome in Summer proceeds from it's ancient aqueducts, the waters of which are diffused among the ruins, or which have inundated the plains, the levels whereof have been interrupted by the magnificent labours of the ancient Romans. The purple fever, the dysentery, the small-pox, so common all over our plains after the heats of Summer, or in warm and humid Springs, proceed for the most part from the puddles of the peasantry, in which leaves and the refuse of plants putrefy. Many of our city-distempers issue from the laystalls which surround them, and from the cemeteries about our churches; and which penetrate into the very sanctuary.

I do not believe there would have been a single unwholesome spot on the Earth if men had not put their hands to it. The

malignity of the air of St. Domingo has been quoted, that of Martinico, of Porto-Bello, and of several districts of America, as a natural effect of Climate. But these places have been inhabited by Savages, who from time immemorial have busied themselves in diverting the course of rivers, and choking up rivulets. These labours constitute even an essential part of their defence. They imitate the beavers in the fortification of their villages, by inundating the adjacent country. Provident Nature however has placed those animals only in cold Latitudes,* where, in imitation of herself, they form lakes which soften the air; and she has introduced running waters into hot Latitudes, because lakes would there speedily change by evaporation into putrid marshes. The lakes which she has scooped out in such Latitudes are all situated among mountains, at the sources of rivers, and in a cool Atmosphere. I am the more induced to impute to the Savages the corruption of the air, so murderous in some of the Antilles, that all the islands which have been found uninhabited were exceedingly wholesome; such as the Isle of France, of Bourbon, of St. Helena, and others.

As the corruption of the air is a subject peculiarly interesting, I shall venture to suggest by the way some simple methods

* The beaver is by no means confined to the cold latitudes. In North-America, at least, this animal is found as far South as latitude 33 deg., and here, as well as in the more northern regions of it's residence, the beaver is distinguished, among other animals, both by it's ingenuity, and by it's wonderful habits of labour and perseverance. Saint-Pierre did not know, that there is a species of beaver in Chili; but this species, though the inhabitant of a cold climate, does not construct either those foundations (dams) or houses which have always rendered this animal an object of so much curiosity and interest to the Naturalists. There is no good reason to conjecture, that the lakes which are formed by the beaver, great as they are, can exert much, if any, effect upon the temperature of the climate: but I think it probable, that such lakes may sometimes prove injurious to the health of a district abounding in the beavers. If there be any foundation for this supposition, the dams of the beaver are very frequently far enough South to produce the common diseases which arise from exhalations from lakes of water. Let us not, then, ascribe to man alone the unwholesomeness of the countries which he inhabits. It rather becomes the Philosopher to acknowledge, that Man *sometimes* improves upon Nature. In other words, he drains marshes, and the smaller lakes; he fills up their basons with a more substantial soil, which he covers with the wheat, the rye, and other valuable grains; and, in this way, he at the same time augments the means of supporting life, while he diminishes the causes of sickness.—B. S. B.

of remedying it. The first is to remove the causes of it, by substituting in place of the stagnant puddles with which our plains abound the use of cisterns, the waters of which are so salubrious when they are judiciously constructed. They are universally employed all over Asia. Care should likewise be taken to prevent the throwing the bodies and other offal of dead animals into the laystalls of our cities; they ought to be carried to the rivers, which will be thereby rendered more productive of fish. In the case of Cities which are not washed by rivers to carry off the garbage, or if this method is found otherwise inconvenient, attention should be paid at least to placing the laystalls only to the North and North-east of such cities, in order to escape, especially during Summer, the fetid gusts which pass over them from the South and South-west.

The second is to abstain from digging canals. We are well acquainted with the maladies which have resulted from those of Egypt, in the vicinity of Rome, and elsewhere, when care is not taken to keep them in repair. Besides the benefits derived from them are very problematical. To look at the medals which have been struck in our own country, on occasion of the canal of Briare, would we not be induced to think that the Strait of Gibraltar was henceforth to become superfluous to the navigation of France? Granting it to have been of some little utility to the interior commerce of the country, has the mischief done to the plains through which it passes been taken into the account as a counterbalance? So many brooks and springs diverted from their course, and collected from every quarter, to be gulped up in one great navigable canal, must have ceased to water a very considerable extent of land. And can that be considered as a great commercial benefit which is injurious to agriculture? Canals are adapted only to marshy places.

This is the third method of contributing to the restoration of the salubrity of the air. The attempts made in France to dry the marshes have always cost us a great many men, and frequently for that very reason have been left incomplete. I can discover no other cause for this but the precipitancy with which such works are undertaken, and the multiplicity of the objects which they are intended to embrace. The Engineer presents his plan, the undertaker gives in his estimate, the minister approves, the prince finds the money, the intendant of the province finds the

labourers; all things concur to the effect proposed, except Nature. From the bosom of rotten earth arise putrid emanations, which presently scatter death among the workmen.

As a remedy to these inconveniencies I beg leave to throw out some observations, which I believe to be well-founded. A piece of land entirely covered with water is never unwholesome. It becomes so only when the water which covers it evaporates, and exposes to the air the muds of it's bottom and sides. The putridity of a morass might be remedied as effectually by transforming it into a lake as into solid ground. It's situation must determine whether of these two objects is to be preferred. If it is in a bottom, and without efflux, the indication of Nature ought to be followed up, and the whole covered with water. If there is not enough to form a complete inundation, it might be cut into deep ditches, and the stuff dug out thrown on the adjoining lands. Thus we should have at once canals always full of water, and little isles both fertile and wholesome. As to the season proper for such labours, the Spring and Autumn ought to be preferred; and great care must be taken to place the labourers with their faces to the windward, and to supply by means of machinery the necessity to which they are frequently subjected, of plunging into mires and muds, to clear them away.

It has always appeared to me strangely unaccountable that in France, where there are such numerous and such judicious establishments, we should have ministers of superintendence in foreign affairs, for war, the marine, finance, commerce, manufactures, the clergy, public buildings, horsemanship, and so on, but never one for agriculture. It proceeds, I am afraid, from the contempt in which the peasantry are there held. All men however are sureties for each other; and independently of the uniform stature and configuration of the Human Race, I would exact no other proof that all spring from one and the same original. It is from the puddle by the side of the poor man's hovel, which has been robbed of the little brook whose stream sweetened it, that the epidemic plague shall issue forth to devour the lordly inhabitants of the neighbouring castle.

Egypt avenges herself by the pestilence arising out of her canals of the oppression of the Turks, who prevent her inhabitants from keeping them in repair. America, sinking under the accumulated strokes of Europeans, exhales from her bosom a

thousand maladies fatal to Europe, and drags down with her the haughty Spaniard expiring on her ruins. Thus the Centaur left, with Deinira, his robe empoisoned with the blood of the Hydra, as a present which should prove fatal to his conqueror. Thus the miseries which oppress Mankind pass from huts to palaces, from the Line to the Poles, from Ages past to Ages yet to come; and their long and lingering effects are a fearful voice crying in the ears of the Potentates of the Earth: "Learn
" to be just, and not to oppress the miserable."

Not only the elements but reason itself corrupts in the haunts of wretchedness. What torrents of error, fear, superstition, discord, have broken out in the lower regions of Society, and swelled to the terror and the subversion of Thrones! The more that men are oppressed the more miserable are their oppressors, and the more feeble is the Nation which they compose. For the force which tyrants employ to support their authority at home, is never exercised but at the expense of that which they might employ to maintain their respectability abroad.

First, from the haunts of misery issue forth prostitution, thefts, murders, conflagrations, highway-robberies, revolts, and a multitude of physical evils besides, which in all countries are the plagues that tyranny produces. But those of opinion are much more terrible. One man is bent on subjugating another, not so much for the sake of getting hold of his property as to command his admiration, his reverence. Ambition proposes to itself no boundary short of this. To whatever condition he may be elevated, and however low his rival reduced; let him have at his mercy the fortune, the labour, the wife, the person of his adversary, he has gained no point unless he has gained his homage. It availed Haman nothing to have the life, the goods of the Jews at his disposal: he must see Mordecai prostrated at his feet. Oppressors are thus the oppressed, and become the arbiters of their own happiness; and the oppressed for the most part paying them back injustice for injustice, disturb them with false reports, religious terrors, dark surmises, calumnies, which engender among them suspicions, apprehensions, jealousies, feuds, law-suits, duels; and at last civil wars, which issue in their total destruction.

Let us examine, in the case of some ancient and modern Governments, this re-action of evils upon each other, and we shall

find it's extent to be in proportion to the ills which they bring upon mankind. On contemplating this tremendous balance, we shall be constrained to acknowledge the existence of Sovereign Justice.

Without paying regard to the common division of Governments* into Democracy, Aristocracy, and Monarchy, which are

* Politicians, in classing Governments according to these exterior resemblances in form, have acted precisely as those Botanists do who comprehend in the same category plants which have similar flowers or leaves, without paying any attention to their virtues. The Botanist classes together the oak and the pimpernel; and the Politician the Roman republic and that of St. Marino. This is not the way of observing nature: her spirit, not her forms, is the great thing which we ought to study.

If in the History of any People you do not attend to it's moral and internal constitution, which scarcely any Historian keeps steadily in view, it will be impossible to conceive how Republics, apparently well constituted, have suddenly sunk into ruin: how others on the contrary in which nothing but agitation appeared, became formidable: whence arise the duration and the power of despotic States, so much decried by modern Authors: and finally, how it came to pass that after the glorious reigns of *Marcus Aurelius* and of *Antoninus*, which have been so highly extolled, the Roman Empire finished it's progress to dissolution. It was, I am bold enough to affirm, because those good Princes thought only of preserving the exterior form of the Government. All was tranquillity around them; the form of a Senate remained; Rome was well supplied with corn; the garrisons in the provinces were regularly paid. There was no sedition, no disturbance, every thing to appearance went on well. But during this lethargy the rich were going on in an unbounded accumulation of property, and the people were loosing the little that they had. The great offices of the State were engrossed by the same families. In order to have the means of subsistence, it was necessary for the commonalty to attach themselves to the Great. Rome contained a populace of mere menials. The love of country was extinguished. The wretched did not know of what to complain. No one did them any wrong. All was orderly; but this very order precluded the possibility of their ever coming to any thing. They did not cut the throats of the citizens, as in the days of *Marius* and *Sylla*, but they stifled them.

In all human Society there are two powers, the one temporal and the other spiritual. You find them in all the Governments of the World, in Europe, in Asia, in Africa, and in America. The Human Race is governed in the same way as the human body. Such is the will of the AUTHOR of Nature, in order to the preservation and happiness of Mankind. When Nations are oppressed by the spiritual power, they resort for protection to the temporal; when this last oppresses in it's turn, they have recourse to the other. When both these concur to render them miserable, then arise heresies in swarms, schisms, civil wars, and a multitude of secondary powers, which balance the abuses of the two first, till there results at length a general apathy, and the State falls into destruction. We shall presently go into a thorough investiga-

only at bottom political forms that determine nothing as to either their happiness or their power, we shall insist only on their moral constitution.

Every Government, of whatever description, is internally happy and respectable abroad, when it bestows on all it's subjects their natural right of acquiring fortune and honours: and the contrary takes place when it reserves to a particular class of citizens the benefits which ought to be common to all. It is not sufficient to prescribe limits to the People, and to restrain them within these by terrifying phantoms. They quickly force the person who puts them in motion to tremble more than themselves. When human policy locks the chain round the ankle of a slave, Divine Justice rivets the other end round the neck of the tyrant.

Few Republics have been more judiciously constituted than that of Lacedemon. Virtue and happiness were seen to flourish there during a period of five hundred years. Notwithstanding the mediocrity of it's extent, it gave law to Greece and to the northern coasts of Asia; but as Lycurgus had not comprehended in his plan either the Nations which Sparta was to subdue, or even the Helots, who laboured the ground for her, by them were introduced the commotions which shattered her constitution, and at length totally subverted it.

In the Roman Republic there subsisted greater equality and proportionally more power and happiness. She was indeed divided into Patricians and Plebeians; but as these last were capable of attaining the highest military dignities, as they possessed besides an exclusive title to the tribunitial office, the power of which equalled, nay surpassed that of the Consuls, the most perfect harmony existed between the two orders. It is impossible to observe without emotion the deference and respect paid by the Plebeians to the Patricians, during the most glorious periods of the Republic. They selected their patrons from among that order; they attended them in crowds on their way to the Senate: when they happened to be poor, they assessed themselves to make up a marriage portion for their daughters. The Patricians on the other hand took an interest in all the af-

tion of this interesting subject when we come to speak of France. We shall find that though there is but one which governs of right, there are five powers which govern in fact.

fairs of the Plebeians ; they pleaded their causes in the Senate ; permitted them to bear their names ; adopted them into their families, and gave them their daughters in marriage, when they distinguished themselves by their virtues. These alliances with Plebeian families were not disdained even by Emperors. *Augustus* gave his only daughter *Julia* in marriage to the Plebeian *Agrippa*. Virtue sat enthroned at Rome ; and no where else upon Earth were altars raised more worthy of her. A judgment of this may be formed from the rewards assigned to illustrious actions. A criminal was condemned to be starved to death in prison ; his daughter is allowed permission to visit him there, and keeps him alive by the milk from her own breast. The Senate, informed of this instance of filial tenderness, voted a pardon to the father in consideration of the daughter, and on the spot where the prison stood, commanded to rear a Temple sacred to filial piety.

If a person condemned was on the way to execution, the sentence was remitted if a vestal happened to pass that way. The punishment due to criminality disappeared in the presence of virtue. If in battle one Roman saved another out of the hands of the enemy, he became entitled to the civic crown. This crown consisted only of oak leaves, nay it was the only military crown which had nothing golden about it, but it conferred the right of sitting in the public theatres on the bench adjoining to those which were allotted to Senators, who all stood up in deference on the entrance of him who wore it. It was, says Pliny, the most illustrious of all crowns, and communicated higher privileges than the mural, the obsidional, and naval crowns, because there is more glory in saving a single citizen than in taking cities, or in gaining battles. It was the same, for this reason, whether the person saved were the commander in chief, or only a private soldier ; but it was not to be earned by delivering an allied King, who might have come to the assistance of the Romans. Rome in the distribution of rewards distinguished only the citizen. By means of such patriotic sentiments she conquered the Earth, but she was just only to her own people ; it was by her injustice to other men that she became weak and unhappy. Her conquests filled her with slaves, who under *Sparticus* brought her to the brink of destruction, and which decided her fate at last by the arms of corruption, much more formidable than those

of war. By the vices and the flatteries of the Grecian and Asiatic slaves at Rome, were formed within her bosom the *Catalines*, the *Cesars*, the *Neros*; and while their voice was corrupting the masters of the World, that of the Goths, the Cimbri, the Teutones, the Gauls, the Allobroges, the Vandals, the companions of their lot, was inviting their compatriots from the North and from the East, who at length levelled the glory of Rome with the dust.

Modern Governments exhibit a similar re-action of equity and felicity, of injustice and misfortune. In Holland, where the people may aspire to every thing, abundance pervades the whole States, good order prevails in the cities, fidelity in wedlock, tranquillity in all minds; disputes and law-suits are rare in that country, because every one is content. Few European Nations possess a territory so contracted, and no one has extended her power so far: her riches are immense: she maintained singly successful war against Spain in all it's splendor, and afterwards against France and England united: her commerce extends over the whole Globe: she possesses powerful colonies in America, thriving settlements in Africa, formidable kingdoms in Asia. But if we trace up to their source the calamities and the wars with which she has been visited for two centuries, it will be found that they proceed from the injustice of some of her settlements in those countries. Her happiness and her power are not to be attributed to her republican form of Government, but that community of benefits which she presents indiscriminately to all her subjects, and which produces the same effects in despotic Governments, of which we have had representations so frightful.

Among the Turks, as among the Dutch, there is no such thing as quarrelling, or calumniating, or stealing, or prostitution, in the cities. Nay, there is not to be found perhaps over the whole Empire a single Turkish woman carrying on the trade of a courtesan. There is in the general mind neither restlessness nor jealousy. Every man sees without envy in his superiors a felicity attainable by himself, and he is at all times ready to lay down his life for the Religion and Government of his country. Their force abroad is by no means inferior to the perfection of their union at home. With whatever contempt our Historians may expose their ignorance and stupidity, they have actually

made themselves masters of the finest provinces of Asia, of Africa, of Europe, nay of the Empire of the Greeks themselves, with all their wit and learning, because the sentiment of patriotism which unites them, is sufficient to baffle all the talents and all the tactics in the world. They have undergone however frequent convulsions from the revolting of the conquered Nations; but the most dangerous proceed from their feeblest adversaries, from those very Greeks whose property they plunder with impunity, and whose children they annually carry off, as a tribute to recruit the Seraglio. From these same children issue, by a re-acting Providence, most of the Janizaries, the Agas, the Pachas, the Bashaws, the Viziers, which oppress the Turks in their turn, and render themselves formidable even to their Sultans.

It is this same community of hopes and of fortunes presented without distinction to all conditions of men, which has given so much energy to Prussia, whose internal police and victories abroad have been so highly celebrated by our political writers; though it's Government is still more despotic than that of Turkey; for the Prince there is absolute master at once in temporals and in spirituals.

The Republic of Venice on the contrary, so well known for her courtezans, for the restlessness and jealousy of her Government, is extremely feeble externally, though she is of higher antiquity, in a situation more advantageous, and under a much finer sky than Holland. Venice is a maritime power in the Mediterranean, hardly acknowledged as such in modern times, whereas Holland is enlivening the whole Earth by her commerce; because the first has restricted the rights of humanity to the class of Nobility, and the second has extended them to the whole people.

It is farther from the influence of this unjust partition that Malta, with the finest port in the Mediterranean, situated between Africa and Europe, in the vicinity of Asia, and swarming with a young Nobility of undaunted courage, will ever remain the last Power in Europe, because the people there are reduced to nothing.

I shall here take occasion to observe, that hereditary nobility in a State destroys at once all emulation in both the nobly and ignobly born. It is destroyed in the first, because being entitled

by birth to pretend to every thing, they have no need to call in the assistance of merit; and in the second, being excluded from every pretension to rise, no degree of merit could avail them. This is the political vice which has undermined the power of Portugal and that of Spain; and not the monastic spirit, as so many Writers have asserted. The monkish order was all powerful from the times of *Ferdinand* and *Isabella*. It was a Monk who decided at Court the expedition of *Christopher Columbus* in quest of a new World, the conquest of which quadrupled in Spain the number of Gentlemen. Not a Spanish soldier went over to America, but gave himself out on his arrival there for a man of family, and who on his return to Spain with money in his pocket did not make good his title. The same thing shewed itself among the Portuguese, who made conquests in Asia. The military order in both these Nations at that time performed prodigies, because the career of ambition in feats of arms was then open to the commonalty. But ever since it has been shut against them, by the prodigious number of gentlemen with which these two States abound, the balance has turned in favour of the monastic order, and conferred upon it a tribunitial Power.

However wonderful our political speculations may represent the threefold counterbalancing powers which constitute the Government of Great Britain, it is to the violent agitations of those powers that we must ascribe the perpetual quarrels which disturb her happiness, and the venality which has at length corrupted her. The Commons, I grant, form one of her Houses of Parliament, but the right of sitting in it as a representative, being restricted to persons possessed of such a revenue, it's doors must of course be shut against the admission of many a wise head, and be open to some not entirely of that description. An *Alcibiades* and a *Cataline* might have made a shining figure there; but a *Socrates*, the just *Aristides*, *Epaminondas*, who transferred the Empire of Greece to Thebes, *Attilius-Regulus*, who was called from the plough to the Dictatorship, *Menenius-Agrippa*, who settled the dispute between the Senate and People; no one of these could have procured a seat, because he had not an estate in land worth so much a year. Britain would destroy herself by her very boasted Constitution, did she not present a common career to every citizen in her Marine. All the Orders of the State concur in this point of union, and give it such a prepon-

derancy, that it fixes their political equilibrium. Whoever could destroy the Marine of England would annihilate her Government. This unanimous concurrence of the whole Nation toward the cultivation of one single Art, has raised it to a height of perfection hitherto unattained in any other Country, and has rendered it the sole instrument of her power.

If we glance a look on the other States which bear the name of Republic, we shall find internal disorder and external weakness, increasing in proportion to the inequality of the citizens. Poland has reserved to the Nobility exclusively all the authority, and left her Commonalty in the most detestable slavery; so that war, which establishes between the citizens of one and the same Nation a community of danger, establishes between those of Poland no community of reward. Her History exhibits nothing but a long series of bloody quarrels between Palatinate and Palatinate, City and City, Family and Family, which have always rendered her extremely miserable. The greatest part of the Nobility themselves are there reduced to such wretchedness, that they are obliged for a subsistence to serve the Grandees in the most contemptible employments, as our Nobility formerly did under the feudal Government, and as is the case to this day in Japan: for wherever the peasantry are slaves, the yeomanry are menials. The calamity has at length overtaken Poland in our own days, which would have fallen upon her long ago, had not the Kingdoms which surround her laboured then under the same defects in their several Constitutions. She has been parcelled out by her neighbours in despite of her long political discussions, as the empire of the Greeks was by the Turks, at a time when certain priests who had got possession of the public mind were amusing them with theological subtilities.

In Japan the wretchedness of the Nobles is in proportion to their tyranny. They formed at first a feudal Government, which it is so easy to subvert, as well as all those of the same nature; for the first of the feudal Chiefs who aspired at the sovereignty effected his purpose by a single battle. He curtailed their power of determining their quarrels by civil wars, but left them in full possession of all their other privileges; that of abusing the peasants, who there are mere slaves, the power of life and death over all who are in their pay, even over their wives. The mass of the people who, in extreme misery, have no way of subsisting

but by intimidating or corrupting their tyrants, have produced in Japan an incredible multitude of bonzes of all sects, who have erected temples on every mountain; comedians and drolls, who have theatres set up in every cross-street of their cities; and courtezans in such shoals, that the traveller is pestered with them on every high road, and at every inn where he stops. But this very people set such a high value on the consideration exacted of them by the Nobility, that if so much as a cross look passes between two of them, fight they must; and if the insult be any thing serious, it is absolutely necessary that both parties should rip up each other, under pain of infamy. To this hatred of it's tyrants we must impute the singular attachment which the Japanese expressed for the Christian Religion, because they hoped it was to efface by it's morality distinctions so abominable between man and man: and to popular prejudices we must refer, in the Nobility of that Country, the contempt which they expressed on a thousand occasions for a life rendered so precarious from the opinions of another.

A sage equality, proportioned to the intelligence and to the talents of all her subjects, has for a long time rendered China the happiest spot on the Globe: but a taste for pleasure having there at last produced a dissolution of the moral principle, money, the instrument of procuring it, is become the moving principle of the Government. Venality has there divided the Nation into two great classes, the rich and the poor. The ancient ranks which in that Country elevated men to all the public offices still exist, but the rich only actually fill them. This vast and populous Empire having no longer any patriotism, but what consists in certain unmeaning ceremonies, has been oftener than once invaded by the Tartars, who were invited into the Country by the calamities which the People endured.

The Negroes in general are considered as the most unfortunate species of Mankind on the face of the Globe. In truth, it looks as if some destiny had doomed them to slavery. The ancient curse pronounced by *Noah** is by some believed to be still actually in effect: "Cursed be Canaan! a servant of servants shall he be unto his brethren." They themselves confirm it by their traditions. If we may give credit to a Dutch

* Genesis, chap. ix. ver. 25.

Author, of the name of *Bosman*, “the Negroes of the Guinea coast allege that GOD having created blacks and whites, proposed to them the power of choosing between two things, namely, the possession of gold, and of the art of reading and writing; and as GOD gave the power of the first choice to the blacks, they preferred gold; and they left learning to the whites, which was accordingly granted them. But that the CREATOR, provoked at the appetite for gold which they had manifested, immediately passed a decree that the whites should have eternal dominion over them, and that they should forever be subject to their white brethren as slaves.*” I do not mean to support by Sacred Authority, nor by that which those unfortunate wretches themselves furnish, the tyranny which we exercise over them. If the malediction of a Father has been able to extend such an influence over his posterity, the benediction of GOD, which under the Christian Religion extends to them as well as to us, re-establishes them in all the liberty of the law of Nature. The precept of Christianity which enjoins us to consider all men as brethren, speaks in their behalf as in behalf of our own countrymen. If this were the proper place, I could demonstrate how Providence enforces in

* *Bosman's Voyage to Guinea*, letter x. This decision of modern Negroes is highly to their honour. They seem to feel the inestimable value of knowledge. But could they have seen in Europe the condition of most men of literature, compared with that of men who possess gold, their tradition would have been completely reversed.

Similar opinions may be traced through other African black tribes, particularly among the blacks of the Cape de Verd Islands, as may be seen in the excellent account given of them by *George Robert*. This unfortunate Navigator was obliged to flee for refuge to the Island of St. John, where he received from the inhabitants the most affecting proofs of generosity and hospitality, after having undergone the most atrociously cruel treatment from his countrymen, the English pirates, who plundered his vessel.

It must however be acknowledged, that if some African tribes excel us in moral qualities, the Negroes in general are very inferior to other Nations in those of the understanding. They have never to this day discovered the address of managing the elephant as the Asiatics have done. They have carried no one species of cultivation to it's highest degree of perfection. They are indebted for that of the greatest part of their alimentary vegetables to the Portuguese and to the Arabians. They practise no one of the liberal Arts, which had made however some progress among the inhabitants of the New World, who are much more modern than they. Nature has placed them on a part of the Continent, from whence they might with ease have penetrated

their favour the laws of universal justice, by rendering their tyrants in our colonies a hundred times more wretched than they are. Besides, how many wars have been kindled among the maritime Powers of Europe on account of the African slave-trade? How many maladies and corruptions of blood in families have not the Negroes produced among us?

But I shall confine myself to their condition in their own country, and to that of their compatriots who abuse their power over them. I do not know that there ever existed among them a single Republic, except it were perhaps some pitiful Aristocracy along the western coast of Africa, such as that of Fantim. They are under the dominion of a multitude of petty tyrants, who sell them at pleasure. But on the other hand the condition of those kings is rendered so deplorable by priests, fetichas, grigris, sudden revolutions, nay from the very want of the common necessities of life, that few of our common sailors would be disposed to change conditions with them. Besides, the Negroes escape a considerable portion of their mise-

into America, as the winds which blow thither are easterly, that is, perfectly fair; but so far from that, that they had not even discovered the islands in their vicinity, such as the Canaries and the Cape de Verds. The black Powers of Africa have never to this hour discovered genius equal to the construction of a brigantine. So far from attempting to extend their boundaries, they have permitted strangers to take possession of all their coasts. For in ancient times the Egyptians and Phenicians settled on their eastern and northern shores, which are now in the possession of the Turks and Arabians. And for some ages past the Portugueze, the English, the Danes, the Dutch, and the French, have laid hold of what remained to the East, to the South, and to the West, simply for the purpose of getting slaves.

It must needs be after all, that a particular Providence should have preserved the patrimony of these children of Canaan from the avidity of their brethren, the children of Shem and Japhet: for it is astonishing that persons such as we are, the sons of Japhet in particular, who as being younger brothers were hunting after fortune all the world over, and who according to the benediction of Noah our Father, were to extend our lodging even into the tents of Shem our eldest brother, should never have established colonies in a part of the world so beautiful as Africa is, so near us, in which the sugarcane, the coffee-plant, and most of the productions of Asia and America can grow, and in a word where slaves are the produce of the soil.

Politicians may ascribe the different characters of Negroes and Europeans to whatever causes they please. For my own part, I say it on the most perfect conviction, that I know no Book which contains monuments more authentic of the History of Nations, and that of Nature, than the Book of Genesis

ries by the thoughtlessness of their temper and the levity of their imagination. They dance in the midst of famine as of abundance ; in chains as when at liberty. If a chicken's foot inspires them with terror, a small slip of white paper restores their courage. Every day they make up and pull to pieces their gods, as the whim strikes them.

It is not in stupid Africa, but in India, the ancient wisdom of which stands in such high reputation, that the miseries of the Human Race are carried to their highest excess. The Bramins, formerly called Brachmans, who are the priests there, have divided the Nation into a variety of Casts, some of which they have devoted to infamy, as that of the Parias. No one will doubt that they have taken care to render their own sacred. No person is worthy to touch them, to eat with them, much less to contract any manner of alliance. They have contrived to prop up this imaginary grandeur by incredible superstitions. From their hands have issued that infinite number of Gods, of monstrous forms, which scare the human imagination all over Asia. The Commonalty, by a natural reaction of opinions, render them in their turn the most miserable of all mankind. They are obliged, in order to support their reputation, to wash themselves from head to foot on the slightest contamination by contact ; to undergo frequent and rigorous fastings ; to submit to penances the most horrible, before idols which they themselves have rendered so tremendous : and as the people are not permitted to intermix blood with them, they constrain, by the power of prejudice over the tyrants, their widows to burn themselves alive with the body of the dead husband.

Is it not then a very horrible condition for men reputed wise, and who give law to their Nation, to be witnessess of the untimely death, in circumstances so shocking, of their female friends and relations, of their daughters, their sisters, their mothers ? Travellers have cried up their knowledge : but is it not an odious alternative for enlightened men either to terrify perpetually the ignorant, by opinions which at the long-run subjugate even those who propagate them ; or if they are so fortunate as to preserve their reason, to make a shameful and criminal use of it by employing it to disseminate falshood ? How is it possible for them to esteem each other ? How is it possible to retire within themselves, and to lift up their eyes to that Divi-

nity, of whom, as we are told, they entertain conceptions so sublime, and of whom they exhibit to the People representations so abominable ?

Whatever may be, as far as their ambition is concerned, the melancholy fruit of their policy, it has drawn in it's train the misery of this vast Empire, situated in the finest region of the Globe. Their military is formed of the Nobility, called Nairs, who possess the second rank in the State. The Bramins, in order to support themselves by force as well as by guile, have admitted them to a participation in some of their privileges. Hear what *Walter Schouten* says of the indifference expressed by the common People towards the Nairs when any mischief befalls them. After a bloody encounter, in which the Dutch killed a considerable number of those who had taken the side of the Portuguese: "No outrage or insult," says he,* "was offered to any artizan, peasant, fisherman, or rather inhabitant of Malabar, not even in the rage of battle. They in consequence never thought of flight. A great many of them were posted at different places merely as spectators of the action; and they appeared to take no manner of interest in the fate of the Nairs."

I have been an eye-witness of the same apathy in Nations whose Nobility forms a separate class, among others, in Poland. The Commonalty of India subject the Nairs as well as the Bramins to their share of the miseries of opinion. The Nairs are incapacitated to contract legitimate marriages. Many of them, known by the name of Amocas, are obliged to sacrifice themselves in battle or on the death of their kings. They are the victims of their unjust honour, as the Bramins are of their inhuman religion. Their courage, which is merely professional spirit, far from being beneficial to their Country, is frequently fatal to it. From time immemorial it has been desolated by their intestine wars; and it is so feeble externally, that handfuls of Europeans have made settlements in it wherever they pleased. At the close of the war in 1762, a proposition was made in the Parliament of Great Britain to make the complete conquest of it, and to pay off the national debt with the riches which might have been extracted out of it; and this the proposer undertook to

* Voyage to the East-Indies, vol. i. page 367.

effect if he was landed in India with an army of five thousand Europeans. The boldness of the enterprize astonished no one of his com-patriots, who were acquainted with the weakness of that Country, and it was laid aside, as is alleged, merely from the injustice of it.

In France the people never acquire any share in the Government, from *Julius Cesar*, who is the first Writer that has made this observation, and who is not the last politician that has availed himself of it to render himself easily it's master, down to Cardinal *Richlieu*, who levelled the feudal power. During this long interval our History presents nothing but a series of dissensions, of civil wars, of dissolute manners, of assassinations, of Gothic laws, of barbarous customs: and furnishes nothing interesting to the Reader, let the President *Henault*, who compares it to the Roman History, say what he will. It is not merely because the fictions of the Romans are more ingenious than ours; it is because we do not find in our History that of a People, but only the history of some great family.

From this however must be excepted the Lives of some good Kings, such as those of *St. Louis*, of *Charles V.* of *Henry IV.* and of some good Men who are interesting to us, for this very reason, that they interested themselves in behalf of the Nation. In every other case it is impossible to discover about what the Government was employing itself; it studied the interest only of the Nobility. The Country was subjugated successively by the Romans, the Franks, the Goths, the Alains, the Normans. The facility with which France embraced Christianity is a proof that she sought in religion a refuge from the miseries of slavery. To this sentiment of confidence the Clergy is indebted for the first rank which it obtained in the State. But the Clergy soon degenerated from their original spirit; and so far from meditating the destruction of tyranny, enlisted under the banner of tyrants; adopted all their customs; assumed their titles; appropriated to themselves their rights and their revenues; and even made use of their arms to maintain interests which were in such direct opposition to their morality. A great many churches had their knights and their champions, who supported their claims in single combat,

It would be unfair to impute to Religion the mischief occasioned by the avarice and ambition of her ministers. She her-

self assists us in detecting their faults, and enjoins us to be on our guard against them. The greatest Saints, St. Jerom* among others, have exposed and condemned the vices of the clergy, with more vehemence than ever modern Philosophers have done. Much has been written of late to discredit Religion, with a view to diminish the power of priests. But, universally, wherever she has fallen their power has increased. Religion herself alone restrains them within due bounds. Observe in the Archipelago and elsewhere, how many fraudulent and lucrative superstitions have been substituted by the Greek *Papas* and *Caloyers*, in place of the spirit of the Gospel! Besides, whatever reproach may be cast upon our own clergy they have their answer ready, namely, that they have been in all ages, like the rest of their compatriots, the children of this world. The Nobles, Magistrates, Soldiers, nay the Kings themselves of former times were no better than they.

They have been accused of promoting every where the spirit of intolerance, and of aiming at superiority by preaching up humility. But most of them, repelled by the world, carry into their professional corps that spirit of intolerance of which the world set the example, and of which they are the victims; and their ambition frequently is a mere consequence of that universal ambition with which national education, and the prejudices of society, inspire all the members of the State.

Without meaning to make their apology, and much less satirically to inveigh against them or any body of men whatever, whose evils it was not my wish to discover, except for the purpose of indicating the remedies which seem to be within their reach, I shall here confine myself to a few reflections on Religion, which is even in this life the avenger of the wicked, and the consolation of the good.

The world in these days considers Religion as the concern only of the vulgar, and as a mere political contrivance to keep them in order. Our Philosophers state in opposition to it the philosophy of *Socrates*, of *Epictetus*, of *Marcus-Aurelius*; as if the morality of those sages were less austere than that of *JESUS CHRIST*; and as if the benefits to be expected from it were better secured than those of the Gospel! What profound knowledge

* Consult his Letters.

of the heart of man; what wonderful adaptation to his necessities; what delicate touches of sensibility are treasured up in that divine Book! I leave it's mysteries out of the question. Part of them we are told have been taken from *Plato*. But *Plato* himself borrowed them from Egypt, into which he had travelled; and the Egyptians were indebted for them, as we are, to the Patriarchs. These mysteries after all are not more incomprehensible than those of Nature, and than that of our own existence. Besides, in our examination of them we inadvertently mislead ourselves. We want to penetrate to their source, and we are capable only of perceiving their effects. Every supernatural cause is equally impenetrable to man. Man himself is only an effect, only a result, only a combination for a moment. He is incapable of judging of divine things according to their nature; his judgment of them must be formed according to his own nature, and from the correspondence which they have to his necessities.

If we make use of these testimonies of our weakness, and of these indications of our heart, in the study of religion, we shall find that there is nothing that can pretend to that name on the face of the Earth, so perfectly adapted to the wants of human nature as the religion of the Bible. I say nothing of the antiquity of it's traditions. The Poets of most Nations, Ovid among the rest, have sung the Creation, the happiness of the Golden Age, the indiscreet curiosity of the first woman, the miseries which issued from *Pandora's Box*, and the Universal Deluge, as if they had copied these histories from the Book of Genesis.

To the Mosaic account of the Creation, and the recent existence of the World, have been objected the antiquity and the multiplicity of certain lavas in volcanos. But have these observations been accurately made? Volcanos must have emitted their fiery currents more frequently in the earlier ages, when the Earth was more covered with forests, and when the Ocean, loaded with it's vegetable spoils, supplied more abundant matter to their furnaces. Besides, as I have said in the course of this Work, it is impossible for us to distinguish between what is old and what is modern in the structure of the World. The hand of Creation must have manifested the impress of ages upon it from the moment of it's birth. Were we to suppose it

eternal, and abandoned to the laws of motion simply, the period must be long past when there could not have been the smallest rising on it's surface. The action of the rains, of the winds, and of gravity, would have brought down every particle of Land to the level of the Seas.

It is not in the works of GOD, but in those of men, that we are enabled to trace epochs. All our monuments announce the late Creation of the Earth which we inhabit. If it were, I will not say eternal, but of high antiquity only, we should surely find some productions of human industry much older than from three to four thousand years, such as all those that we are acquainted with. We have certain substances on which time makes no very perceptible alteration. I have seen, in the possession of the intelligent Count *de Caylus*, constellation rings of gold, or Egyptian talismans, as entire as if they had just come from the hand of the workman. Savages who have no knowledge of iron are acquainted with gold, and search after it as much for it's durability as for it's shining colour. Instead then of finding antiques of only three or four thousand years, such as those of the most ancient Nations, we ought to possess some of sixty, of a hundred, of two hundred thousand years.

Lucretius, who ascribes the Creation of the World to atoms, on a system of Physics altogether unintelligible, admits that it is quite a recent production.

Præterea, si nulla fuit genitalis origo
Terræ & cæli, semperque eterna fuere,
Cur supra bellum Thebanum, & funera Trojæ,
Non alias alii quoque res cecinere Poetæ.

De rerum Natura, Lib. v. ver. 325

Thus imitated :

If genial Nature gave the Heavens no birth,
And from eternal ages roll'd the Earth,
Why neither wars nor Poets—Sages, tell,
Till *Homer* sung, how mighty *Hector* fell !*

* I add for the information of the reader, Mr. Mason Good's translation of these lines :

“ Yet grant this heaven, this earth the heaven surrounds,
“ Time ne'er produc'd, eternal of themselves—
“ Whence ere the THEBAN war, and fate of TROY
“ Have earlier bards no earlier actions sung ?”

The Nature of Things : a didactic Poem. vol. ii. Book v. l. 337—340.

B. S. B.

“ Had Heaven and Earth known no beginning of existence, but endured from eternity, why have we no Poets transmitting to us the knowledge of great events prior to the Theban war, and the downfall of Troy ?”

The Earth is filled with the religious traditions of our Scriptures : they serve as a foundation to the religion of the Turks, the Persians, and the Arabians : they extend over the greatest part of Africa : we find them again in India, from whence all Nations and all Arts originally proceeded : We can trace them in the ancient and intricate religion of the Bramins ;* in the History of Brama, or Abraham ; of his wife Sarai, or Sara ; in the incarnations of Wistnou, or of Christnou ; in a word, they are diffused even among the savage tribes which traverse America.

I say nothing of the monuments of our Religion, as universally diffused as her traditions, one of which, inexplicable on the principles of our Physics, proves a general Deluge, by the wrecks of marine bodies scattered over the surface of the Globe ; the other, irreconcilable to the laws of our Politics, attests the reprobation of the Jews, dispersed over all regions, hated, despised, persecuted, without Government, without a Country ; nevertheless always numerous, always subsisting, and always tenacious of their Law. To no purpose have attempts been made to trace resemblances between their condition and that of several other Nations, as the Armenians, the Guebres, and the Banians. But these last-mentioned Nations hardly emigrate beyond the confines of Asia : their numbers are extremely inconsiderable : they are neither hated nor persecuted by other Nations ; they have a Country ; and finally, they have not adhered to the religion of their ancestors. Certain illustrious Authors have stated these supernatural proofs of a Divine Justice in a very striking light. I shall satisfy myself with adducing a few more still more affecting, from their correspondence to Nature and to the necessities of Mankind.

The morality of the Gospel has been challenged, because JESUS CHRIST, in the country of the Gadarencs, permitted a legion of demons to take possession of a herd of two thousand swine, which were thereby precipitated into the Sea, and choked.—“ Why,” ask the objectors, “ ruin the proprietors of

* See *Abraham Rogers*, his *History of the Manners of the Bramins*.

“ those animals ?” **JESUS CHRIST** acted in this as a Legislator. The persons to whom the swine belonged were Jews ; they transgressed, therefore, the Law which declares those animals unclean. But here again starts up a new objection, levelled at **Moses**. “ Why are those animals pronounced unclean ?” Because in the Climate of Judea they are subject to the leprosy. But here is a fresh triumph for our Wits. “ The Law of **Moses**,” say they, “ was then relative to Climate ; it could be at most, of consequence, a mere political constitution.” To this I answer, that if I found in either the Old Testament or the New, any usage whatever that was not relative to the Laws of Nature, I should be still more astonished. It is the character of a Religion divinely inspired to be perfectly adapted to the happiness of Man, and the Laws antecedently enacted by the **AUTHOR** of Nature. From this want of correspondence all false religions may be detected. And as to the point in question, the Law of **Moses**, from it’s privations, was evidently intended to be the Law of a particular People ; whereas that of the Gospel, from it’s universality, must have been intended for the whole Human Race.

Paganism, Judaism, Mahometanism, have all prohibited the use of certain species of animal food : so that if one of those religions should become universal, it would produce either total destruction, or unbounded multiplication : each of which evidently would violate the plan of the Creation. The Jews and Turks proscribe pork ; the Indians of the Ganges reverence the heifer and the peacock. There is not an animal existing which would not serve as a Feticha to some Negro, or as a Manitou to some Savage. The Christian Religion alone permits the necessary use of all animals ; and prescribes abstinence from those of the Land, only at the season when they are procreating, and when those of the Sea abound on the shores early in the Spring.*

* Is it possible to abstain from smiling ? No, the prejudices of education in a good man excite a serious emotion in a benevolent mind. Brought up in the habit of abstinence from animal food during the season of Lent, good *M. de Saint-Pierre* takes it for granted that this is an institution of Christianity, and endeavours ingeniously to reconcile it to a law of Nature. But the truth is, the Gospel contains no such injunction ; and the universality of that Religion is still greater than even the enlarged mind of our Author apprehended, in one respect at least. How can it be imagined that **JESUS**

All religions have filled their temples with carnage, and immolated to DEITY the life of the brute creation. The Bramins themselves, so full of compassion to the beasts, present to their idols the blood and life of men. The Turks offer in sacrifice camels and sheep. Our Religion, more pure, if we attend merely to the matter of the sacrifice, presents in homage to GOD bread and wine, which are the most delicious gifts which he has bestowed on Man. Nay, here we must observe, that the vine, which grows from the Line up to the fifty-second degree of North Latitude, and from England to Japan, is the most widely diffused of all fruit-trees; that corn is almost the only one of alimentary plants which thrives in all Climates; and that the liquor of the one, and the flour of the other, is capable of being preserved for ages, and of being transported to every corner of the Earth.

All religions have permitted to men a plurality of women in marriage: Christianity permitted but one, long before our Politicians had observed that the two sexes are born in nearly equal numbers. All have boasted of their genealogies; and regarding with contempt most other Nations, have permitted their votaries, when they had it in their power, to reduce them to a state of slavery. Ours alone has protected the liberty of all men, and has called them back to one and the same destination,

CHRIST, in fasting so long in the Wilderness, intended to set the example of an annual abstinence of the same duration to his disciples? What Jew ever thought of making *Moses* a pattern in this same respect? But while I regret the power of prejudice in another, let me take care that my own be overcome; or if any remain, that they be harmless, or rather on the side of virtue.

In the very next paragraph our Author is betrayed into a similar mistake, respecting the nature and design of the Sacrament of the Lord's Supper, by the phrase in use in that Church whose communion he had from education adopted. That ordinance is in Roman Catholic countries denominated the *sacrifice* of the mass. Carried away by the word *sacrifice*, *M. de Saint-Pierre* is led to represent the Christian Worshipper as presenting to GOD in the Sacrament an *offering* of bread and wine. But it is not so. He is commanded to *take and eat, to take and drink*, in remembrance of CHRIST. The sacrifice which Christianity demands, and which every sincere communicant presents to GOD, is the *living sacrifice* of himself, which St. Paul calls our *reasonable service*. We meet however with a beautiful train of thought in what follows respecting the elementary part of the institution, strongly characteristic of a pious, penetrating, and comprehensive mind; and which the devout Protestant may peruse to advantage.—H. H.

as to one and the same origin. The religion of the Indians promises pleasure in this world; that of the Jews riches; that of the Turks conquest; ours enjoins the practice of virtue, and promises the reward of it in Heaven. Christianity alone knew that our unbounded passions were of divine original. It has not limited love in the heart of Man to wife and children, but extends it to all Mankind: it circumscribes not ambition to the sphere of a party, to the glory of one Nation, but has directed it to Heaven and Immortality: Our Religion intended that our passions should minister as wings to our virtues.* So far from

* Religion alone gives a sublime character to our passions. It diffuses charms ineffable over innocence, and communicates a divine majesty to grief. Of this I beg leave to quote two instances. The one is extracted from an account, not in very high estimation, of the island of St. Erini, (chap. xii.) by Father *Francis Richard*, a Jesuit-missionary; but which contains some things that please me from their native simplicity. Of the other I was an eye witness.

"After dinner," says Father *Richard*, "I retired to St. George's, which is the principal Church of the Island of Staphalia. There one of the *Papas* presented to me a book of the Gospels, in order to discover if I could read their language as well as I spake it. Another came and asked me whether our holy father the Pope were a married man. But I was still more amused by the question of an old woman, who, after looking steadily at me for a considerable time, besought me to tell her if I really believed in GOD and in the Holy Trinity. Yes, said I, and to give her full assurance of it, I made the sign of the cross. O! how glad am I, says she, that you are a Christian! We had some doubts of it. On this I pulled from my bosom the cross which I wore: The woman, quite transported with joy, exclaimed, Why should we any longer call in question his being a good Catholic, seeing he worships the cross! After her another applied to me, of whom I asked whether she had a mind to confess. How! replied she, would it not be a sin to confess to such gentlemen as you? No, said I, for though I am French, I confess in Greek. I will go, replied she, and ask our Bishop. In a little while she returned, perfectly delighted at having obtained his permission. After confession I gave her an *Agnus Dei*, which she went about and shewed to every one as a curiosity which they had never seen before. I was presently beset by a multitude of women and children, who pressed me to give them some. I answered, that those *Agnuses* were given only to such as had confessed. In order to gain their point they instantly offered to confess, and wanted to do so by pairs; that is to say, a young girl with her female confidant, a young man with his bosom-friend, whom they denominated *Adelphepeithon*, confidential brother, alledging as a reason, that they had but one heart; and that therefore there ought to be nothing secret between them. It was with difficulty I could separate them; however they were under the necessity of submitting."

uniting us on Earth, to render us miserable, it is she who bursts asunder the chains by which we are held captive. How many calamities has she soothed! how many tears has she wiped away! how many hopes has she inspired, when there was no longer room for hope! how many doors of mercy thrown open to the guilty! how many supports given to innocence! Ah! when our altars arose amidst our forests, ensanguined by the knives of the Druids, how the oppressed flocked to them in quest of an asylum! How many irreconcilable enemies there embraced with tears! Tyrants, melted to pity, felt from the

Some years ago I happened to be at Dieppe, about the time of the autumnal Equinox; and a gale of wind having sprung up, as is common at that season, I went to look at it's effects on the sea-shore. It might be about noon. Several large boats had gone out of the harbour in the morning on a fishing expedition. While I was observing their manœuvres, I perceived a company of country lasses, handsome, as the *Cauchoises* generally are, coming out of the city with their long white head-dresses, which the wind set a flying about their faces. They advanced playfully to the extremity of the pier, which was from time to time covered with the spray excited by the dashing of the waves. One of them kept aloof, sad and thoughtful. She looked wistfully at the distant boats, some of which were hardly perceptible, amidst a very black Horizon. Her comrades at first began to rally, with an intention to amuse her: What, said they, is your sweetheart yonder? But finding her continue inflexibly pensive, they called out, Come, come, don't let us stop any longer here! Why do you make yourself so uneasy? Return, return with us; and they resumed the road that led to town. The young woman followed them with a slow pace, without making any reply, and when they had got nearly out of sight, behind some heaps of pebbles which are on the road, she approached a great crucifix that stands about the middle of the pier, took some money out of her pocket, dropped it into the little chest at the foot of the cross; then kneeled down, and with clasped hands and eyes lifted up to Heaven put up her prayer. The billows breaking with a deafening noise on the shore, the wind which agitated the large lanterns of the crucifix, the danger at sea, the uneasiness on the land, confidence in Heaven, gave to the love of this poor country girl an extent and a dignity, which the Palaces of the Great cannot communicate to their passions.

It was not long before her tranquillity returned; for all the boats gained the harbour a few hours afterward, without having sustained the slightest injury.

Religion has been frequently calumniated, by having the blame of our political evils laid to her charge. Hear what *Montagne*, who lived in the midst of those civil wars, says on the subject; "Let us confess the truth: Who ever should make a draught from the army, even the most legally emboldened, of those who serve from the zeal of a religious affection, and add to them such as regard only the protection of the laws of their Country, or the service of their Prince, would find it difficult to make up of them one complete company of soldiers." *Essays*, Book ii. chap. xii. page 317.

height of, their towers their arms drop from their hands. They had known the empire only of terror, and they saw that of charity spring up in it's room. Lovers ran thither to mingle vows, and to swear a mutual affection, which should survive even the tomb. She did not allow a single day to hatred, and promised eternity to love. Ah! if this Religion was designed only for the consolation of the miserable, it was of course designed to promote that of the Human Race!

Whatever may have been said of the ambition of the Church of Rome, she has frequently interposed in behalf of suffering humanity. I produce an instance taken at random, and which I submit to the judgment of the reader. It is on the subject of the African slave-trade, which is practised without scruple by all the Christian and maritime Powers of Europe, and condemned by the Court of Rome. "In the second year of his mission, *Merolla* was left alone at Sogno, by the death of the Superior General, whose place *Father Joseph Busseto* went to fill at the Convent of Angola. Much about the same time the Capuchin missionaries received a letter from Cardinal *Cibo*, in name of the sacred College. It contained severe reproaches on the continuation of the sale of slaves, and earnest remonstrances to put an end at last to that abominable traffic. But they saw little appearance of having it in their power to execute the orders of the Holy See, because the commerce of the Country consists entirely in ivory and slaves."* All the efforts of the missionaries issued simply in an exclusion of the English from a share of the traffic.

The earth would be a paradise, were the Christian Religion producing universally it's native effects. It is Christianity which has abolished slavery in the greatest part of Europe. It wrested in France enormous possessions out of the hands of the Earls and Barons, and destroyed there a part of their inhuman rights by the terrors of a life to come. But the people opposed still another bulwark to tyranny, and that was the power of the Women.

Our Historians are at pains to remark the influence which some women have had under certain reigns, but never that

* Extract from the *General History of Voyages*, by the Abbé *Prevost*. Book xxii. page 180: *Merolla*, A. D. 1633.

of the sex in general. They do not write the History of the Nation, but merely the History of the Princes. Women are nothing in their eyes unless they are decorated with titles. It was however from this feeble division of Society that Providence from time to time called forth it's principal defenders. I say nothing of those intrepid females who have repelled even by arms the invaders of their country, such as *Joan of Arc*, to whom Rome and Greece would have erected altars : I speak of those who have defended the nation from internal foes, much more formidable still than foreign assailants ; of those who are powerful from their weakness, and who have nothing to fear because they have nothing to hope.

From the sceptre down to the shepherdesses' crook, there is perhaps no country in Europe where women are treated so unkindly by the Laws as in France ; and there is no one where they have more power. I believe it is the only kingdom of Europe where they are absolutely excluded from the throne. In my country a father can marry his daughters without giving them any other portion than a chaplet of roses : at his death they have all together only the portion of a younger child. This unjust distribution of property is common to the clown as to the gentleman. In the other parts of the kingdom, if they are richer, they are not happier. They are rather sold than given in marriage. Of a hundred young women who there enter into the married state, there is not perhaps one who is united to her lover. Their condition was even still more wretched in former times. Cesar, in his Commentaries, informs us, " That the husband had the power of life and death over his wife, as well as over his children ; that when a man of noble birth happened to die, the relations of the family assembled ; if there was the slightest shadow of suspicion against his wife, she was put to the torture as a slave ; and if found guilty was condemned to the flames, after a previous process of inexpressible sufferings."*

What is singularly strange, at that very time, and even before, they enjoyed the most unbounded power. Hear what good *Plutarch* says on the subject, as he is communicated to us through the medium of the great *Amyot*. " Before the Gauls had passed the

* Gallic War, book vi.

“ Alps, and got possession of that part of Italy which they now
 “ inhabit, a violent and alarming sedition arose among them,
 “ which issued in a civil war. But their wives, just as the
 “ two armies were on the point of engaging, threw themselves
 “ into the intervening space ; and taking up the cause of their
 “ dissention, discussed it with so much wisdom, and decided
 “ upon it with such moderation and equity, that they gave com-
 “ plete satisfaction to both parties. The result was an unanimous
 “ return to mutual benevolence and cordial friendship, which
 “ reunited not only city to city, but family to family : and this
 “ with so much effect, that ever since they invariably consult
 “ their wives on all deliberations, whether respecting war or
 “ peace ; and they settle all disputes and differences with neigh-
 “ bours and allies conformably to the advice of the women. Ac-
 “ cordingly, in the agreement which they made with *Hannibal*,
 “ when he marched through Gaul, among other stipulations,
 “ this was one, that if the Gauls should have occasion to com-
 “ plain of any injury done them by the Carthaginians, the cause
 “ was to be submitted to the decision of the Carthaginian offi-
 “ cers and Governors serving in Spain : and if, on the contrary,
 “ the Carthaginians could allege any ground of complaint
 “ against the Gauls, the matter should be left to the determina-
 “ tion of the Wives of the Gauls.”*

It will be difficult to reconcile these two clashing authorities, unless we pay attention to the re-action of human things. The power of women proceeds from their oppression. The commonalty, as oppressed as they, gave them their confidence, as they had given theirs to the people. Both parties were wretched, but misery attracted them toward each other, and they made a common stock of woe. They decided with the greater equity, that they had nothing to gain or lose. To the women we must ascribe the spirit of gallantry, the thoughtlessness, the gaiety, and above all the taste for raillery which have at all times characterized our Nation. With a song simply they have oftener than once made our tyrants tremble. Their ballads have sent many a banner into the field, and put many a battalion to flight. It is by them that ridicule has acquired such a prodigious influence in France, as to have become the most

* Plutarch, vol. ii. in folio : Virtuous Actions of Women ; page 233

terrible weapon which it is possible to employ, though it be the armour only of the weak, because women are the first to lay hold of it; and as from national prejudice their esteem is the first of blessings, it follows that their contempt must be the most grievous calamity imaginable.*

Cardinal *Richlieu* having at last restored to Kings the legislative authority, thereby stripped the Nobility in a great measure of the power of injuring each other by civil wars; but he was not able to abolish among them the rage for duelling, because the root of this prejudice is in the people, and because edicts have no power over their opinions when they are oppressed. The edict of the Prince prohibits the gentleman to go to meet his antagonist in single combat, and the opinion of his valet-de-chambre forces him out. The nobility arrogate to themselves all the national honour, but the people determine for them the object of it, and allot it's proportions. *Louis XIV.* however gave back to the People a part of their natural liberty, by means of his very despotism. As he hardly saw any thing else in the world except himself, every one appeared to his eyes nearly equal. It was his wish that all his subjects should have permission to contribute their exertions toward the extension of his glory, and he rewarded them in proportion as such exertions had promoted this end. The desire of pleasing the Prince reduced all to a level. Under that reign of consequence were seen multitudes of men of all classes, rendering themselves eminent each in his several way. But the misfortunes of that great King, and perhaps his policy, having obliged him to descend to the sale of employments, of which the pernicious example had been set him by his predecessors, and which has been extended since his time to the meanest offices of the State,

* A provincial Academy some years ago proposed this question as the subject for the prize of St. *Louis*: "In what manner female education might be made to contribute toward rendering men better?" I treated it, and was guilty of committing two faults of ignorance, not to mention others. The first was, my presuming to write on such a subject, after *Fenelon* had composed an excellent treatise on the education of young women; and the second, to think of arguing for truth in an Academy. The one in question did not bestow the prize, and recalled it's subject. All that can be said on this question is, that in every country women are indebted for their empire only to their virtues, and to the interest which they have always taken in behalf of the miserable.

this gave the finishing stroke to the ancient preponderancy of the Nobility; but it gave rise in the Nation to a power much more dangerous; that of gold. This, this has levelled every rival influence, and triumphed over even the power of women.*

And first, the Nobility, having preserved a part of their privileges in the country; trades-people possessed of some fortune do not chuse to live there, for fear of being exposed on the one hand to insult, and of being confounded on the other with the peasantry, by paying tallage and drawing for the militia. They like better to live in small cities, where a multitude of financial employments and revenues enable them to subsist in indolence and listlessness, rather than to vivify the fields which degrade their cultivators. Hence it comes to pass that small landed estates sink in value, and are year after year falling into the hands of the great proprietors. The rich, who make the purchases of them, parry the inconveniencies to which they are subject, either by their personal nobility, or by buying off the imposts under which they labour.

I know well that a celebrated Farmer-general some years ago greatly cried up the over-grown proprietors, because, as he alleged, they could afford to give a better bargain than the smaller: but without considering whether they could sell corn cheaper, and all the other consequences of the *nett produce*, which attempts have been made to establish as the alone standard and object of agriculture, nay of morality; it is certain, that if any given number of wealthy families were year after year to purchase the lands which might lie commodiously for them, such family bargains would speedily become fatal to the

* As most men are shocked at abuses only by seeing them in detail, because every thing great dazzles and commands respect, I shall here produce a few instances of the effect of venality in the lower orders of Society. All these subaltern conditions which naturally rank under others of right, are become the superiors, in fact, merely because they are the richer. Accordingly it is the Apothecary now-a-days who has the employing of the Physician; the Attorney of the Advocate; the Handicraft of the Merchant; the Master-mason of the Architect; the Bookseller of the Scholar, even those of the Academy; the Chair-hirer in Church of the Preacher, &c. I shall say no more. It is easy to see to what all this leads. From this venality alone must ensue the decline of all talents. It is in fact abundantly perceptible, on comparing those of the age in which we live with those of the age of *Louis XIV.*

State. I have often been astonished that there is no law in France to prevent the unbounded accumulation of landed property. The Romans had censors, who limited in the first instance the extent of a man's possession to seven acres, as being sufficient for the subsistence of one family. By the word which we translate *acre*, was understood as much land as a yoke of oxen could plough in one day. As Rome increased in luxury, it was extended to five hundred: but even this Law, though indulgent in the extreme, was soon infringed, and the infraction hurried forward the ruin of the Republic.

"Extensive parks," says *Pliny*,* "and unbounded domains, have ruined our own Italy, and the Provinces which the Romans have conquered: for that which occasioned the victories obtained by *Nero* (the Consul) in Africa was simply this, six men were in possession of almost one half of Numidia when *Nero* defeated them." *Plutarch* informs us, that in his time, under *Trajan*, you could not have raised three thousand men in all Greece, which had formerly furnished armies so numerous; and that you might have sometimes travelled a whole day on the high roads without meeting a human being, except now and then a straggling solitary shepherd. The reason was, Greece had by this time been parcelled out among a few great proprietors.

Conquerors have always met with a very feeble resistance in countries where property is very unequally divided. We have examples of this in all ages, from the invasion of the Lower-Empire by the Turks down to that of Poland in our own days. Overgrown estates destroy the spirit of patriotism at once in those who have every thing, and in those who have nothing. "The shocks of corn," said *Xenophon*, "inspire those who raise them with courage to defend them. The sight of them in the fields is as a prize exhibited in the middle of the theatre, to crown the conqueror."

Such is the danger to which excessive inequality of property exposes a State outwardly; let us take a look of the internal mischief which it produces. I have heard a person of undoubted veracity relate, that an old Comptroller-general having retired to his native province, made a very considerable pur-

* Natural History, Book xviii. chap. iii. and vi.

chase in land. His estate was surrounded by about fifty small manors, the annual rent of which might be from fifteen hundred to two thousand livres each.* The proprietors of these were good country gentlemen, who had through a succession of generations supplied their Country with gallant officers and respectable matrons. The Comptroller-general, desirous of extending his landed property, invited them to his castle, entertained them magnificently, gave them a taste for Parisian luxury, and concluded with an offer of double the value of their estates, if they thought proper to dispose of them. They to a man accepted his offer, imagining they were going to double their revenue, and in the hope, no less fallacious to a country gentleman, of securing a powerful protector at Court. But the difficulty of laying out their money to advantage, a taste for elegant expense, inspired by the sight of sums of money such as they never before had in their coffers, in a word, frequent journies to Paris, and back to the country, soon melted away the price of their patrimony. These respectable families disappeared one after another; and thirty years afterward, one of their descendants, who could reckon among his ancestors a long succession of captains of dragoons, and knights of *St. Louis*, was found scampering over his paternal inheritance, soliciting the place of keeper of a salt-office, to keep him from starving.

Such are the mischiefs produced among the citizens of a country by the excessive accumulation of property. Those produced on the state of the lands are not less to be deplored. I was some years ago in Normandy, at the house of a gentleman in affluent circumstances, who cultivated himself a very considerable grass-farm, situated on a rising ground, of a very indifferent soil. He walked me round his vast enclosure, till we came to a large space completely over-run with mosses, horse-tail, and thistles. Not a blade of good grass was to be seen. The soil, in truth, was at once ferruginous and marshy. They had intersected it with many trenches, to drain off the water, but all to no purpose: nothing could grow.

Immediately below there was a series of small farms, the face of which was closed with grassy verdure, planted with apple-trees in full fruit, and enclosed with tall alder-trees. The cows

* About from sixty to fourscore guineas.

were feeding among the trees of the orchards, while the country-girls sung as they were spinning around the door. These "native wood-notes wild," repeated from distance to distance under the shade of the trees, communicated to this little hamlet a vivacity which increased still more the nakedness and the depressing solitude of the spot where we were. I asked it's possessor, How it came to pass that lands so contiguous should present an aspect so very different?

"They are," replied he, "of the self-same nature, and there formerly were on this very spot small houses similar to those which you see below. I made a purchase of them, but sadly to my loss. Their late inhabitants having abundance of leisure, and a small compass of ground on their hands, cleared away the mosses, the thistles, manured it; up sprung the grass. Had they a mind to plant? They dug holes, they removed the stones, and filled them with good mould, which they went to collect from the bottom of the ditches, and along the highway's side. Their trees took root and prospered. But all these necessary operations cost me incredible time and expense. I never was able to make the common interest of my money."

I am bound in justice to remark, that this wretched steward, but excellent gentleman, in every sense of that word, was at that very time relieving by his charity most of those ancient farmers now disabled to earn a livelihood. Here then is another instance of both men and lands rendered useless by the injudicious extension of property. It is not upon the face of vast dominions, but into the bosom of industry, that the FATHER of Mankind pours out the precious fruits of the Earth.

I could easily demonstrate that enormous property is the principal cause of the multiplication of the poor all over the kingdom, for the very reason which has procured it the eulogium of many of our Writers, namely, that it spares men the labours of Agriculture. There are many places where there is no employment to give the peasantry during a considerable part of the year; but I shall insist only on their wretchedness, which seems to increase with the riches of the district where their lot is cast.

The district of Caux is the most fertile country which I know in the World. Agriculture, on the great scale, is there carried

to the height of perfection. The deepness of the soil, which in some places extends to five and six feet; the manure supplied from the stratum of marle over which it is raised, and that of the marine plants on it's shores, which are spread over it's surface, concur toward clothing it with the noblest vegetables. The corn, the trees, the cattle, the women, are there handsomer and more vigorous than any where else. But as the Laws have assigned in that province in every family two-thirds of the landed property to the first-born, you find there unbounded affluence on the one hand, and extreme indigence on the other.

I happened one day to be walking through this fine country; and admired as I went it's plains so well cultivated, and so extensive, that the eye loses itself in the unbounded prospect. Their long ridges of corn, humouring the undulations of the plain, and terminating only in villages, and castles surrounded with venerable trees, presented the appearance of a sea of verdure, with here and there an island rising out of the Horizon. It was in the month of March, and very early in the morning. It blew extremely cold from the North-east. I perceived something red running across the fields at some distance, and making toward the great road, about a quarter of a league before me. I quickened my pace, and got up in time enough to see that they were two little girls in red jackets and wooden shoes, who with much difficulty were scrambling through the ditch which bounded the road. The tallest, who might be about six or seven years old, was crying bitterly. "Child," said I to her, "what makes you cry, and whither are you going at so early an hour?" "Sir," replied she, "my poor mother is very ill. There is not a mess of broth to be had in all our parish. We are going to that church in the bottom to try if the Curé of this parish can find us some. I am crying because my little sister is not able to walk any farther." As she spake, she wiped her eyes with a bit of canvas which served her for a petticoat. On her raising up the rag to her face, I could perceive that she had not the semblance of a shift. The abject misery of the children, so poor, in the midst of plains so fruitful, wrung my heart. The relief which I could administer to them was small indeed. I myself was then on my way to see misery in other forms.

The number of wretches is so great in the best cantons of this province, that they amount to a fourth, nay to a third of the inhabitants in every parish. The evil is continually on the increase. These observations are founded on my personal experience, and on the testimony of many parish-ministers of undoubted veracity. Some Lords of the Manor order a distribution of bread to be made once a week to most of their peasantry, to eke out their livelihood. Ye stewards of the public, reflect that Normandy is the richest of our provinces; and extend your calculations and your proportions to the rest of the Kingdom! Let the morality of the financier supersede that of the Gospel; for my own part, I desire no better proof of the superiority of Religion to the reasonings of Philosophy, and of the goodness of the national heart to the enlarged views of our policy, than this, that notwithstanding the deficiency imputable to our laws and our errors, in almost every respect, the State continues to support itself, because charity and humanity almost constantly interpose in aid of Government.

Picardy, Brittany, and other provinces, are incomparably more to be pitied than Normandy. If there be twenty-one millions of persons in France, as is alleged, there must be then at least seven millions of paupers. This proportion by no means diminishes in the cities, as may be concluded from the number of foundlings in Paris, which amounts one year with another to six or seven thousand, whereas the number of children not abandoned by their parents does not exceed in that great city fourteen or fifteen thousand. And it is reasonable to suppose, that among these last there must be a very considerable proportion the progeny of indigent families. The others are partly, it must be admitted, the fruit of libertinism; but irregularity in morals proves equally the misery of the people, and even more powerfully, as it constrains them at once to renounce virtue, and to stifle the very first feelings of Nature.

The spirit of finance has accumulated all these woes on the head of the People, by stripping them of most of the means of subsistence; but what is infinitely more to be regretted, it has sapped the foundations of their morality. It no longer esteems or commends any but those who are making a fortune. If any respect be still paid by it to talents and virtue, this is the only

reason, it considers these as one of the roads to wealth. Nay, what in the phrase of the world is called good company, has hardly any other way of thinking. But I should be glad to know, whether there be any honourable method of making a fortune, for a man who has not already got money, in a country where every thing is put up to sale. A man must at least intrigue, unite himself to a party and flatter it, secure puff-ers and protectors; and for this purpose he must be dishonest, corrupt, he must adulate, deceive, adopt another man's passions, good or bad; in a word, let himself down in one shape or another. I have seen persons attain every variety of situation; but I speak it without reserve, whatever praise may have been bestowed on their merit, and though many of them really had merit, I never saw any one, even of the strictest honour, raise himself and preserve his situation, but by the sacrifice of some virtue.

Let us now look at the re-actions of those evils. The people usually balance the vices of their oppressors by their own. They oppose corruption to corruption. From the prolific womb of vulgar debauchery issues a monstrous swarm of buffoons, comedians, dealers in luxury of every sort, nay even men of letters, who to flatter the rich, and to save themselves from indigence, extend dissipation of manners and of opinions to the remotest extremity of Europe. In the class of the unmarried vulgar we find the most powerful bulwark opposed to rank and wealth. As this is a very numerous body, and comprehends not only the youth of both sexes, who with us do not form early marriages, but an infinite number of men besides, who from peculiarity of condition, or want of fortune, are deprived, as youth must be, of the honours of Society, and of the first pleasures of Nature, they constitute a formidable association, which has all reputations at their mercy; together with the power of disturbing the peace of all families. These are the persons who retail for a dinner that inexhaustible collection of anecdotes, favourable or unfavourable, which are in every instance to regulate public opinion.

It is not in the power of a rich man to marry a handsome wife, and enjoy himself at home in his own way; those persons lay him under the necessity, unless he would be laughed at, that is, under pain of the severest evil which can befall a Frenchman,

of making his wife the central point of all fashionable society ; he must exhibit her at all public places ; and must adopt the manners which his plebeian dictators think proper to prescribe, however contradictory they may be to Nature, and however inconsistent with conjugal felicity. While, as a regularly embodied army, they dispose of the reputation and the pleasures of the rich, two of the columns attack their fortune in front, in two different ways. The one employs the method of intimidation, and the other that of seduction.

I shall not here confine my reflections to the power and wealth which are gradually acquired by several religious orders, but extend them to their number in general. Some politicians pretend, that France would become too populous were there no convents in it. Are England and Holland over-peopled, where there is no such thing as a convent ? It betrays besides little acquaintance with the resources of Nature. The more inhabitants that any country contains, the more productive it is. France could maintain, perhaps four times more people than it now contains, were it like China, parcelled out into a great number of small freeholds. We must not form our judgment of it's fertility from it's immense domains. Those vast deserted districts yield only one crop in two years, or at most two in three. But with how many crops, and how many men, are small tenements covered ! Observe in the vicinity even of Paris the meadow-land of St Gervais. The soil is in general of a middling quality ; and notwithstanding there is no species of vegetable which our Climate admits of, but what the industry of cultivation is there capable of producing. You see at once fields of corn, meadow-grounds, kitchen-gardens, flower-pots, fruit-trees, and stately forest-trees. I have seen there in the same field cherry-trees growing in potatoe-beds ; vines clambering up along the cherry-trees, and lofty walnut-trees rising above the vines ; four crops, one above another, within the earth, upon the earth, and in the air. No hedge is to be seen there, separating possession from possession, but what present an inter-communication worthy of the Golden Age.

Here a young rustic, with a basket and ladder, mounts a fruit-tree, like another *Vertumnus* ; while some young girl in a winding of the adjoining valley sings her song loud enough to be heard by him, presenting the image of another *Pomona*. If cruel

prejudices have stricken with sterility and solitude a considerable part of France, and have henceforth allotted the possession of a great kingdom to a little handful of proprietors, how is it that instead of Founders of new orders, Founders of new colonies do not arise among us, as among the Egyptians and the Greeks? Shall France never have to boast of an *Inachus*, and of a *Danaus*? Why do we force the African tribes to cultivate our lands in America, while our own peasantry is starving for want of employment at home? Why do we not transport thither our miserable poor by families; children, old men, lovers, cousins, nay the very churches and saints of our villages, that they may find in those far distant lands the loves and the illusions of a country.

Ah! had liberty and equality been invited to those regions, where Nature does so much with moderate cultivation, the cottages of the New World would at this day have been preferable to the palaces of the Old. Will another Arcadia never spring up in some corner of the Earth? When I imagined I had some influence with men in power, I endeavoured to exert it in projects of this nature; but I have never had the felicity of falling in with a single one who took a warm interest in the happiness of Mankind. I have endeavoured to trace at least the plan of them, as a legacy to those who shall come after me, but the clouds of calamity have spread a gloom over my own life; and the possibility of enjoying happiness, even in a dream, is no longer my portion.

Politicians have considered war itself as necessary to a State, because, as they pretend, it takes off the superflux of Mankind. in general these gentlemen have a very limited knowledge of Human Nature. Independent of the resources of the subdivision of property into small allotments, which every where multiply the fruits of the Earth, we may rest assured that there is no country but what has the means of emigration within it's reach, especially since the discovery of the New World. Besides, there is not a single State, even among those which are best peopled, but what contains immense tracks of uncultivated land. China and Bengal are, I believe, the countries on the Globe which contain most inhabitants. In China, nevertheless, are many and extensive deserts amidst it's finest provinces, because avarice attracts those who should cultivate them to the vi-

cinity of great rivers, and to the cities, for the conveniency of commerce. Many enlightened travellers have made this observation.

Hear what the honest Dutchman, *Walter Schouten*, says of the deserts of Bengal. "Toward the South, along the sea-coast, "at the mouth of the Ganges, there is a very considerable extent of territory desert and uncultivated, from the indolence and inactivity of the inhabitants, and also from the fear which they are under of the incursions of those of Arracan; and of the crocodiles and other monsters which devour men, lurking in the deserts, by the sides of brooks, of rivers, of morasses, and in caverns."* Obstacles very inconsiderable, it must be allowed, in a Nation where Fathers sometimes sell their children for want of the means of supporting them! *Bernier*, the physician, remarks likewise, in his travels over the Mogul Empire, that he found a great many but deserted islands at the mouth of the Ganges.

We must ascribe in general to the excessive number of bachelors, that of profligate women; who universally are in exact proportion to each other. This evil too is the effect of a natural re-action. As the two sexes are born and die in nearly equal numbers, every man comes into the world and leaves it in company with his female. Every man therefore who prefers celibacy to the married state, dooms a female at the same time to a single life. The ecclesiastical order robs the sex of so many husbands; and the social order deprives them of the means of subsistence. Our manufactures and machinery, so ingeniously industrious, have swallowed up almost all the arts by which they were formerly enabled to earn a livelihood. I do not speak of those who knit stockings, embroider, weave, &c. employments which in better times so many worthy matrons followed, but which are now entirely engrossed by persons bred to the business; but we have, forsooth! taylors, shoe-makers, male hair-dressers for the ladies. We have men-milliners, dealers in linen, gauze, muslin, gum-flowers. Men are not ashamed to assume to themselves the easy and commodious occupations, and to leave to the poor women the rougher and more laborious. We have female dealers in cattle, in pigs,

* *Walter Schouten's Voyage to the East Indies*, vol. ii. page 154.

driving through fairs on horseback : there are others who vend bricks, and navigate barges, quite embrowned with the sun ; some even labour in quarries.

We meet multitudes in Paris sweating under an enormous load of linen, under heavy water-pails, blacking shoes on the quays ; others yoked like beasts to little carts. Thus the sexes unsex themselves ; the men dwindle into females, the women harden into men. The greatest part of females in truth would rather turn their charms to account than their strength. But what mischief is every day produced by women of the town ! What conjugal infidelity, what domestic plunder, what quarrelling, beating, duelling, do they occasion ! Scarcely has night begun to spread her curtain, when every street is inundated with them ; every place of resort swarms with these unhappy creatures : at every corner they lie in wait for their prey. Others of them known by the name, now of some consideration among the vulgar, of *kept mistresses*, loll it away to the opera and play-house in magnificent equipages. They take the lead at the balls and festivals of the better sort of our trades-folks. For them in part arise in the suburbs, in the midst of gardens in the English taste, gay alcoves in the Egyptian stile. Every one of them bent on melting down a fortune. It is thus GOD punishes the oppressors of a People by the oppressed. While the rich are dreaming that they are expending their substance in tranquillity, men springing from the dregs plunder them in their turns by the torments of opinion : if they are so fortunate as to escape these, fall they must into the hands of abandoned women ; who, if they should happen to miss the fathers make sure of indemnifying themselves upon the children.

An attempt has been made for some years past to give encouragement to virtue, in our poor country girls, by festivals called *Rosiers* (rose-feasts) ; for as to those who are rich, and our city dames in business, the respect which they owe to their fortune permits them not to put themselves on a level with the female peasantry, even at the foot of the altar. But you who bestow crowns on virtue, are you not afraid of blighting the prize by your touch ; Know you not that among Nations who really honour virtue, the Prince only, or the voice of the country, presumed to confer the crown ? The pro-consul *Apronius* refused the civic crown to a soldier who had merited it, because he

considered this privilege as belonging only to the Emperor. *Tiberius* bestowed it, finding fault with *Apronius* for not having done it, in quality of Pro-consul.* Have you been informed in what respect virginity was held among the Romans? The vestals had the maces of the Prætors borne before them. We have mentioned on a former occasion that their presence merely bestowed a pardon on the criminal going to execution, provided that the Vestals could affirm they did not pass that way expressly for the purpose. They had a particular bench allotted them at the public festivals; and several Empresses requested, as the highest honour which they could aspire to, permission to sit among them. And our Paris trades-people too crown our rustic Vestals!† Noble and generous effort! They bestow a garland of roses upon indigent virtue in the country; while in the city vice flaunts about glittering with diamonds.

On the other hand, the punishments of guilt appear to me as injudiciously adjusted as the rewards of virtue. We too frequently hear called aloud in our streets these terrible words, *The sentence of condemnation!* but never, *the sentence of reward.* Crimes are repressed by infamous punishments. A simple brand inflicted, instead of reforming the criminal, frequently plunges him deeper in guilt, and not seldom drives his whole family headlong into vicious courses. Where, let me ask, can an unhappy wretch find refuge, who has been publicly whipped, branded, and drummed out? Necessity has made him a thief; indignation and despair will hurry him on to murder. His relations, dishonoured in the public estimation, abandon their home, and become vagabonds. His sisters give themselves up to prostitution.

These effects of the fear which the hangman impresses on the lower orders, are considered as prejudices salutary to them. But they produce, as far as I am able to judge, unspeakable mischief. The vulgar extend them to actions the most indifferent, and convert them into a bitter aggravation of misery. Of this I witnessed an instance on board a vessel, in which I was

* *Annals of Tacitus*, book iii. year 6.

† They *condescend* likewise to permit the youthful peasants to eat at the same table with themselves, for that day. See the journals of these festivities, which break out into raptures on such occasions.

a passenger, on my return from the Isle of France. I observed that not one of the sailors would eat in company with the cook of the ship ; they hardly deigned even to speak to him. I enquired the reason of this at the Captain. He told me, that being at Pégú about six months before, he had left this man on shore to take charge of a warehouse which the people of the country had lent him. When night came on these people locked the door of it, and carried home the key with them. The store-keeper being on the inside, and not having it in his power to go out to disburthen nature, was under the necessity of easing himself in a corner. Unfortunately this warehouse was likewise a church. In the morning the proprietors came and opened the door ; but observing that the place was polluted, they fell upon the poor store-keeper, with loud exclamations, bound him fast, and delivered him over to the executioner, who would have immediately hanged him, unless the Captain of the vessel, seconded by a Portugeze Bishop, who was also the King's brother, had hastened to interpose in his behalf, and saved him from the gallows. From that moment the sailors considered their countryman as degraded, from having passed, as they alleged, through the hands of the hangman.

This prejudice did not exist among either the Greeks or Romans. There are no traces of it among the Turks, the Russians, and the Chinese. It does not proceed from a sense of honour, nor even from the shame of guilt ; it is attached only to the species of punishment. The decapitation of a man for the crimes of treason and perfidy, or his being shot for desertion, are considered as no stigma on the family of the person thus punished. The people, sunk below their level, despise that only which is peculiar to themselves, and show no pity in their decisions, because they are miserable.

The wretchedness of the lower orders is therefore the principal source of our physical and moral maladies. There is another, no less fertile in mischief, I mean the education of children. This branch of political economy engaged among the Ancients the attention of the greatest Legislators. The Persians, the Egyptians, and the Chinese, made it the basis of their Government. On this foundation *Lycurgus* reared the fabric of the Spartan Republic. We may even go so far as to affirm, that wherever there is no national education, there is no durable le-

gislation. With us education has no manner of reference to the constitution of the State. Our most celebrated Writers, such as *Montagne, Fenelon, John James Rousseau* and others, have been abundantly sensible how defective our police is in this respect : but despairing perhaps of effecting a reformation, they have preferred offering plans of private and domestic education, to patching up the old method, and adapting it to all the absurdities of the present state of Society. For my own part, as I am tracing up our evils to their source, only in the view of exculpating Nature, and in the hope that some favoured genius may one day arise to apply a remedy, I find myself farther engaged to examine into the influence of education on our particular happiness, and on that of our Country in general.

Man is the only sensible being who forms his reason on continual observations. His education begins with life, and ends only with death. His days would fleet away in a state of perpetual uncertainty, unless the novelty of objects, and the flexibility of his brain gave, to the impressions of his early years, a character not to be effaced. At that period of life are formed the inclinations and the aversions which influence the whole of our existence. Our first affections are likewise the last. They accompany us through the events with which human life is variegated. They re-appear in old age, and then revive the sensibilities of childhood with still greater force than those of mature age. Early habits have an influence even on animals, to such a degree as to extinguish their natural instinct. *Lycurgus* exhibited a striking example of this to the Lacedemonians, in the case of two hounds taken from the same litter, in one of which education had completely triumphed over Nature. But I could produce still stronger instances in the Human Species, in which early habit is found triumphant sometimes even over ambition. History furnishes innumerable examples to this purpose ; I beg leave to produce one which has not yet obtained a place in the historic page, and which is apparently of no great importance, though it be highly interesting to myself, because it brings to my recollection persons who were justly dear to me.

When I was in the Russian service, I frequently had the pleasure of dining at the table of his Excellency *M. de Villebois*,*

* *Nicolas de Villebois* was a native of Finland, but descended from a French family originally from Brittany. In the battle of Francfort he turned the tide

Grand Master of Artillery, and General of the corps of engineers to which I belonged. I observed that there was every day served up to him a plate of something gray-coloured, I could not tell what, and similar in form to small pebbles. He ate very heartily of this dish, but never presented it to any one at table; though his entertainments were always given in the most elegant style, and every other dish was indiscriminately recommended to his guests, of whatever rank. He one day perceived me looking attentively at his favourite mess; and asked, with a smile, if I would please to taste it. I accepted his offer, and found that it consisted of little balls of curdled milk, salted, and besprinkled with anise-seeds, but so hard and so tough that it cost me inexpressible exertion to force my teeth through them, to swallow them down was absolutely impossible.

“These are,” said the Grand Master to me, “the cheeses

of victory decidedly in favour of Russia, by charging the Prussians at the head of a regiment of fusileers of the artillery, of which he was then Colonel. This action, joined to his personal merit, procured for him the blue ribbon of St. Andrew, and soon after the place of Grand Master of the Ordnance, which he held at the time of my arrival in Russia. Though his credit was then on the decline, he procured me an admission into the service of her Imperial Majesty *Catharine II.* and did me the honour of presenting me to her as one of the officers of his corps of engineers. He was making arrangements, in concert with General *Daniel de Bosquet*, Commander in Chief of the corps of engineers, for my farther promotion in it. They both employed all their powers of persuasion to retain me in that service, and endeavoured to render it agreeable by every affectionate and polite attention, and by assurances of an honourable and advantageous establishment. But the love which I had to my country, in whose service I was previously engaged, and to which I still wished to devote my services, a fond wish, fed with vain hopes, by men of very high character, induced me to persist in demanding my dismissal, which I obtained, with Captain's rank, in 1765.

On leaving Russia, I made an effort to serve my country at my own expense, by joining that party in Poland which France had espoused. There I was exposed to very great risks, having been made prisoner by the Polonese-Russian party. On my return to Paris, I presented memorials respecting the state of things in the North to the Minister for Foreign Affairs, in which I predicted the future partition of Poland by the Powers contiguous. This partition actually took place some years afterward. I have since endeavoured to deserve well of my country by my services, both military, in the West-Indies in my capacity of Captain of the Royal Engineers, and literary, in France, and I add with confidence, by my conduct likewise: but I have not hitherto enjoyed the felicity of experiencing, in my fortune, that my country has been pleased graciously to accept the various sacrifices which I saw it my duty to make to her.

“ of my native country. It is a taste which I acquired in my
 “ boyish days. I was accustomed, when a child, to feed with
 “ the peasants on these coarse milk beverages. When I am
 “ travelling, and have got to a distance from great towns, on
 “ coming near a country village, I send on my servants and car-
 “ riages before; and then my great delight is to go unattended,
 “ and carefully muffled up in my cloak, into the house of the
 “ first peasant on the road, and devour an earthen pot-full of
 “ curdled milk, stuffed full of brown bread. On my last jour-
 “ ney into Livonia, on one of those occasions, I met with an
 “ adventure which amused me very highly. While I was
 “ breakfasting in this style, in comes a man singing cheerly, and
 “ carrying a parcel on his shoulder. He sat down by me, and
 “ desired the landlord to give him a breakfast such as mine. I
 “ asked this traveller so gay, whence he came, and which way
 “ he was going. *I am a sailor, says he, and just arrived from*
 “ *a voyage to India; I disembarked at Riga, and am on my re-*
 “ *turn to Herland, which is my native country, where I have not*
 “ *been these three years. I shall stay there till I have spent these*
 “ *hundred crowns,* pulling out a leathern bag, and chinking the
 “ money. I asked him several questions about the countries he
 “ had seen, which he answered very pertinently. *But,* said I
 “ *to him, what will you do when your hundred crowns are gone?*
 “ *Oh!* says he, *I will return to Holland, embark again for India,*
 “ *earn another bag of crowns, come back and enjoy myself in*
 “ *Herland, in Franconia, my native country.* The good humour
 “ and thoughtlessness of the fellow diverted me exceedingly,”
 continued the Grand Master. “ To confess the truth, I envied
 “ his situation.”

Wise Nature, in giving so much force to early habits, intended that our happiness should depend on those who are most concerned to promote it, that is, our parents; for on the affections which they at that season inspire, depends the affection which we are one day to be called upon to return. But with us, as soon as the child is born, he is transferred to a mercenary nurse. The first bond, which Nature intended should attach him to his parents, is burst asunder before it is formed. The day will come, perhaps, when he will behold the funeral procession of those who gave him birth leave his father's door with as much indifference as they saw his cradle turned out. He may

be recalled home, it is true, at the age when the graces, when innocence, when the necessity of having an object of affection should fix him there for ever. But he is permitted to taste those sweets, only to make him feel in a little while the bitterness of having them taken away from him. He is sent to school; he is put to board far from home. There he is doomed to shed tears which no maternal hand is ever more to wipe away. It is there he is to form friendships with strangers, pregnant with regret and repentance; and there he must learn to extinguish the natural affections of brother, of sister, of father, of mother, which are the most powerful, and the sweetest chains by which Nature attaches us to our country.

After this first horrid outrage committed on his young heart, others equally violent are offered to his understanding. His tender memory must be loaded with ablatives, with conjunctions, with conjugations. The blossom of human life is sacrificed to the metaphysical jargon of a dead language. What Frenchman could submit to the torture of learning his own in that manner? And if there be those who have exercised such laborious patience, do they speak better than persons who have never endured such drudgery? Who writes best; a lady of the Court, or a pedantic grammarian? *Montagne*, so replenished with the ancient beauties of the Latin tongue, and who has given so much energy to our own, congratulates himself on *never having understood what the word vocative meant*. To learn to speak by grammar rules, is the same thing with learning to walk by the laws of equilibrium. It is practice that teaches the grammar of a language, and the passions are our best instructors in the rhetoric of it. It is only at the age, and in places where they expand, that the beauties of *Virgil* and *Horace* are felt, a thing which our most celebrated college translators never dreamt of.

I recollect that when I was at school, I was for a long time stunned, as other boys are, by a chaos of barbarous terms; and that when I happened to catch a glimpse, in the Author I was studying, of any stroke of genius which met my reason, or any sentiment which made it's way to my heart, I kissed the book for joy. It filled me with astonishment to find that the Ancients had common sense. I imagined that there must be as great a difference between their reason and mine, as there was in the construction of our two languages. I have known seven

ral of my school-fellows so disgusted at Latin Authors, by those college explanations, that long after they had bidden farewell to the seminary, they could not bear to hear the names of them mentioned. But when they came to be formed by acquaintance with the world, and by the operation of the passions, they became perfectly sensible of their beauties, and resorted to them as the most delightful of all companions. It is thus that children with us become stupified ; and that an unnatural constraint is used to repress a period of life all fire and activity, transforming it into a state, sad, sedentary, and speculative, which has a dismal influence on the temperament, by ingrafting maladies without number upon it. But these after all amount only to the production of languor and physical evils. But they are trained to vice ; they are decoyed into ambition under the guise of emulation.

Of the two passions which are the moving principles of the human heart, namely love and ambition, the last is by far the most durable, and the most dangerous. Ambition is the last that dies in the aged, and our mode of education puts it prematurely in motion in the young. It would be infinitely better to assist them in directing their early tender affections toward an amiable object. Most men are destined one time or other to feel the power of this gentle passion. Nature has besides made it the firmest cement of Society. If their age, or rather, if our financial manners forbid a commerce of early love, their young affections ought to be directed into the channel of friendship, and thus, as *Plato* proposes in his Republic, and as *Pelopidas* effected at Thebes, battalions of friends might be formed among them, at all seasons prepared to devote themselves in the service of their Country.*

* *Divide & impera* (divide and govern) is a saying, I believe, of *Machiavel's*. Judge of the goodness of this maxim, from the miserable state of the country which gave it birth, and where it has been reduced into practice.

Children at Sparta were taught only to obey, to love virtue, to love their country, and to live in the most intimate union, till they were divided in their schools into two classes, of *Lovers* and *Beloved*. Among the other Nations of Greece, education was arbitrary ; it consisted of a great variety of exercises of eloquence, of wrestling, of running, of pythian, of olympic, of isthmian prizes, &c. These frivolities fostered undue partialities, Lacedemon gave Law to them all : and while the first, on going to engage in the battles of their country, needed the stimulus of pay, of harangues, of trumpets, of cla-

But ambition never rises except at the expense of another. Give it whatever specious name you please, it is ever the sworn enemy of all virtue. It is the source of vices the most dangerous and detestable; of jealousy, of hatred, of intolerance, and cruelty; for every one is disposed to gratify it in his own way. It is forbidden to all men by Nature and Religion, and to the greatest part of subjects, by Government. In our colleges, a lad is brought up to empire, who must be doomed for life to sell pepper. The young people, the hope of a great Nation, are there employed for at least seven years in learning to be the first in the art of declamation, of versification, of prattling. For one who succeeds in these trivial pursuits, how many thousands lose at once their health and their Latin!

It is emulation we are told which awakens talents. It would be an easy task to demonstrate that the most celebrated Writers, in every walk of literature, never were brought up at college, from *Homer*, who was acquainted with no language but his own, down to *John James Rousseau*, who was a very indifferent Latin scholar. How many young men have made a brilliant figure in the run of the classes, who were by and by totally eclipsed in the vast sphere of Literature! Italy is crowded with colleges and academies; but can she boast at this day of so much as one man eminently distinguished? Do we not see there, on the contrary, talents distracted, by ill-assorted societies, by jealousies, by cabals, by intrigues, and by all the restlessness of ambition, become enfeebled, and melt away?

I think I am able to perceive still another reason of this decline; it is, that nothing is studied in those seminaries but the methods and forms of learning, or what in the Painter's phrase is called *manner*. This study, by fixing us in the tract of a master, forces us out of the path of Nature, which is the source of all talents. Look to France, and observe what are the arts brought there to the highest perfection; and you will find that they are those for which there is no public school, no prize, no academy: such as milliners, jewellers, hair-dressers, cooks, &c.

rions, to excite their courage, it was necessary, on the contrary, to repress the ardor of the Lacedemonians. They went to battle, unstimulated by mercenary considerations, or by eloquent addresses, but to the sound of the flute, and singing in one grand concert, the hymn of the two twin brothers, *Castor* and *Pollux*.

We have, it is true, men of high reputation in the liberal arts, and in the sciences ; but these men had acquired their talents before they were introduced into academies. Besides, will any one venture to affirm that they are equal to those of preceding ages, who appeared before academies existed ? After all, admitting that talents are formed in colleges, they would not for that be less prejudicial to the Nation ; for it is of inconceivably more importance that a Country should possess virtue rather than talents, and that men should be happy rather than men renowned. A treacherous glare covers the vices of those who succeed in our Colleges. But in the multitude who never succeed, secret jealousies, malicious whispers, mean flatteries, and all the vices of a negative ambition are already in a state of fermentation, and prepared to burst forth, at the command of their leader, upon the World.

While depravity is thus taking possession of the *hearts* of children, some branches of education go directly to the perversion of their *reason*. These two abuses always walk hand in hand. First, they are taught to deduce false consequences. The Regent informs them that *Jupiter*, *Mercury*, and *Apollo*, are gods : the Parish-minister tells them that they are demons. The professor assures his pupil that *Virgil*, who has so nobly supported the doctrine of a Providence, is got at least to the Elysian fields, and that he enjoys in this world the esteem of all good men : The Curé informs him that this same *Virgil* was a pagan, and must certainly be damned. The Gospel holds a contradictory language in another respect ; it recommends to the young man to be the last ; his college urges him by all means to be the first : virtue commands him to descend ; education bids him rise. And what renders the contradiction still more glaring to the poor lad, it frequently proceeds, especially in the country, from one and the same mouth : for the same good Ecclesiastic in many places teaches the classics in the morning, and the catechism at night.

I can very easily conceive how the matter may be arranged, and contradictions reconciled, in the head of the Regent ; but they must of necessity confound and perplex all the ideas of the Learner, who is not paid for comprehending, as the other is for retailing them.

The case is much worse when subjects of terror are employed, where nothing ought to be administered but consolation. When application is made to them, for example, at the age of innocence, of the woes pronounced by JESUS CHRIST against the Pharisees, the Doctors, and the other tyrants of the Jewish nation; or when their tender organs are shocked by certain monstrous images so common in our churches, how dreadful is the consequence? I knew a young man who in his infancy was so terrified with the dragon of St. Marguerite, with which his preceptor had threatened him in the village-church, that he actually fell sick of horror, believing that he saw the monster constantly at his pillow, ready to devour him. His father, in order to quiet his disturbed imagination, was under the necessity of appearing sword in hand to attack the dragon, and of pretending that he had killed him. Thus, as our method is, one error was driven out by another. When grown up, the first use which he made of his reason was to reflect, that the persons who were intrusted with the formation of that faculty had imposed upon him twice.

After having elevated a poor boy above his equals, by the title of Emperor, and even above the whole Human Race, by that Son of the Church, he is cruelly brought low by rigorous and degrading punishments. "Among other things," says *Montagne*,* "that part of the police of most of our schools has always given me much offence. They ought, at all hazards, certainly with much less disadvantage, to have adopted the extreme of indulgence. Youth immured presents the most horrid of all gaols. To punish a child before he is debauched, is an infallible method to debauch him. If you happen to pass when the lesson is delivering, you hear nothing but the cries of poor children undergoing chastisement, and the storming of masters intoxicated with rage. What a method to inspire with the love of learning, those tender and timid spirits, to drive them to it with surly looks, and birchen-armed hand! Unjust, pernicious proceeding! Add to this what *Quintilian* has well remarked on the subject, that this impetuous authority is pregnant with the most dangerous consequences, particularly from the mode of chastisement. How

* *Essays*, book i. chap. 25.

“ much more decent an appearance would their classes exhibit, “ strewed with flowers and verdant boughs, than with the fragments of bloody rods? I would have portrayed in them, Joy, “ Gaiety, Flora, the Graces, as the Philosopher *Speusippus* had “ in his school. Where should their improvement be looked “ for, but where their pleasure is?”*

I have seen at college many a pretty creature ready to fall into a swoon with pain, receive on their little hands up to a dozen of sharp strokes. I have seen, by the infliction of this punishment, the skin separated from the tip of their fingers, and the bare flesh exposed. What shall be said of those infamous punishments, which produce a disgraceful effect at once on the morals of both scholars and regents, and of which a thousand examples might be adduced? It is impossible to enter into any detail on this subject, without putting modesty to the blush. And yet they are employed by priests! They rest on a passage from *Solomon's* writings, of this import. “ He that spareth the rod “ hateth the child.” But who knows whether the Jews themselves practised corporal punishment after our fashion? The Turks, who have retained a great part of their usages, hold this in detestation. It has been diffused over Europe only by the corruption of the Greeks of the Lower Empire, and it was introduced there by the Monks. If the Jews actually employed it, who can tell but their ferocity might proceed from this part of their education?

Esides, there are in the Old Testament many advices never intended for our use. We find in it passages of very difficult explication, examples dangerous, and laws impracticable. In *Leviticus*, for example, the use of swine's flesh is prohibited. It is represented as a crime worthy of death to violate the Sabbath-day, by working upon it; that of killing an ox † without

* *Michael Montagne* is likewise one of those men who were not educated at college; the time of his continuance there at least was very short. He was instructed without tasting corporal punishment, and without emulation, under the paternal roof, by the gentlest of fathers, and by preceptors whose memory he has preciousely enlained in his writings. He became, by means of an education so diametrically opposite to ours, one of the best, and one of the most intelligent men of the Nation.

† In what part of the Mosaic Institution could our Author possibly find this penal statute? It is surely unnecessary to give infidelity a groundless triumph.—H. H.

the camp is forbidden under a like punishment, &c. *St. Paul*, in his Epistle to the Galatians, says positively, that the Law of *Moses* is a Law of servitude ; he compares it to the slave *Hagar*, whom *Abraham* repudiated. Whatever respect may be due to the writings of *Solomon*, and to the Laws of *Moses*, we are not their disciples, but the disciples of *HIM* who said, "suffer little children to come to Me ; forbid them not ;" of *HIM* who blessed them and said, that in order to enter the kingdom of Heaven, we must become like them.

Our children subverted by the vices of a faulty education, become false reasoners, knavish, hypocritical, envious, ugly, and wicked. In proportion as they increase in age, they increase also in malignity, and in the spirit of contradiction. There is not a single school-boy who knows any thing of the laws of his Country, but there are some who may have heard talk about those of the Twelve Tables. No one of them can tell how our own wars are conducted ; but many are able to entertain you with some account of the wars of the Greeks and Romans. There is not one of them but knows that single combat is prohibited ; and many of them go to the fencing-schools, where the only thing taught is to fight duels. They are sent thither, we are told, merely to learn a graceful carriage, and to walk like gentlemen ; as if a gentleman must walk in the positions of *tierce* and *quarte*, and as if the gait and attitude of a citizen ought to be that of gladiator.

Others, destined to functions more peaceful, are put to school to learn the art of disputation. Truth, we are gravely told, is struck out of the collision of opinions. There may be something like wit in the expression. But for my own part, I should find myself incapable of distinguishing truth, if I met with her in the heat of a dispute. I should suspect that I was dazzled, either by my own passion, or that of another man. Out of disputations have arisen sophisms, heresies, paradoxes, errors of every kind. Truth never shows her face before tyrants ; and every man who disputes would be a tyrant if he could. The light of truth has no resemblance to the fatal corruscations of the thunder, produced by the clashing of the elements, but to the brightness of the sun, which is perfectly pure only when Heaven is without a cloud.

I shall not follow our youth into the World, where the greatest merit of ancient times could be of no manner of service to him. What should he make of his magnanimous republican sentiments under a despotism ; and of those of disinterestedness in a country where every thing is bought and sold ? What use could he make even of the impassable philosophy of a *Dio- geneses*, in cities where beggars are taken up and sent to the house of correction ? Youth would be sufficiently unhappy, even supposing it to have preserved only that fear of blame, and that desire of commendation, under which it's studies were conducted. Influenced from first to last by the opinion of another, and having in itself no steady principle, the silliest of women will rule over him with more unbounded empire than his professor. But, let us say what we will, the colleges will be always full. All I pretend to plead for is, that children should be delivered at least from that tedious apprenticeship to misery, by which they are depraved at the happiest and most amiable period of their existence, and which has afterward so much influence on their characters. Man is born good. It is Society that renders him wicked ; and our mode of education prepares the way for it.

As my testimony is not of sufficient weight to bear out an assertion of so much importance, I shall produce several which are not liable to suspicion, and which I shall extract at random from the writings of Ecclesiastics, not in conformity to their opinions, which are dictated by their condition, but resulting from their personal experience, which in this respect absolutely deranges their whole theory.

Here is one from Father *Claude d' Abbeville*, a Capuchin Missionary, on the subject of the children of the inhabitants of the Island of Naragnan, on the coast of Brasil ; where he had laid the foundations of a colony, whose fate has been similar to that of so many others, which have been lost by our want of perseverance, and by our unhappy divisions, the usual and natural consequence of injudicious education. “ Farther, I know not “ whether it be from the singular affection which fathers and “ mothers here bear to their children, but certain it is, they never say a word which can possibly give them the slightest “ uneasiness ; they are left at perfect liberty to do just what they “ please, and to take their own way in every case, without any

“ apprehension of reproof whatever. It is accordingly a most
 “ astonishing appearance, and what has often excited admira-
 “ tion in myself and many others, (and with good reason) the
 “ children hardly ever do any thing that can displease their pa-
 “ rents ; on the contrary, they are at pains to do every thing
 “ which they know, or imagine, will be agreeable to them*.”
 He afterwards presents a very favourable portrait of their phy-
 sical and moral qualities.

His testimony is confirmed by *John de Lery*, as far as it respects the Brasilians, whose manners are the same, and who are in the near neighbourhood of that island. I beg leave to produce another, that of *Anthony Biet*, Superior of the Missionary Priests, who in the year 1652 went over to Cayenne, another colony lost to us from the same causes, and since indifferently settled. It is on the subject of the Galibis savages.†

“ The mother takes great delight in nursing her child.
 “ There is no such thing known among them as giving out
 “ their children to be nursed by a stranger. They are fond of
 “ their children to excess. They bathe them regularly every
 “ day in a fountain or river. They do not swaddle them, but
 “ put them to sleep in a little bed of cotton, made expressly for
 “ the purpose. They always leave them quite naked : their pro-
 “ gress in growth is perfectly wonderful ; some are able to walk
 “ alone at the age of eight or nine months. When grown to a
 “ certain age, if they are incapable of walking upright, they
 “ march along on their hands and feet. Those people love
 “ their children to distraction. They never chide nor beat
 “ them, but permit them to enjoy perfect liberty ; which they
 “ never abuse by doing any thing to vex their parents. They
 “ express great astonishment, when they see any of our people
 “ correct their children.”

Here is a third extracted from the work of a Jesuit, I mean Father *Charlevoix*, a man of various and extensive learning. It is a passage from his voyage to New Orleans, another colony which we have suffered to fall to nothing, through our divisions, a consequence of our moral constitution, and of our system of education. He is speaking in general of the Savages of North America.

* History of the Mission of Capuchin Fathers to the Island of Maragnan, chap. xlvii.

† Voyages to the Equinoctial Countries, book iii. page 390

“ Sometimes,* as the means of correcting their faults, they employ prayers and tears, but never threatenings.—A mother who sees her daughter behave improperly, falls a crying. The daughter naturally asks what is the matter with her, and she satisfies herself with replying, *You dishonour me.* This mode of reproof seldom fails to produce the effect intended. Since, however, they have had a little more commerce with the French, some of them begin to chastise their children; but scarcely any except among those who are *Christians*, or who are fixed in the colony. The severest punishment usually inflicted by the Savages for correcting their children, is to throw a little water in their face.—Young women have been known to hang themselves for having received from a mother some slight reprimand, or a few drops of water thrown in the face; after giving warning of what they were going to do, in these words, *You shall no longer have a daughter.*”

It is very amusing to observe the embarrassment of this Author, in attempting to reconcile his European prejudices with his remarks as a traveller; which produces perpetual contradictions in the course of his work. “ It would seem,” says he, “ that a childhood so badly disciplined must be succeeded by a very turbulent and very corrupted youth.” He admits that reason directs those people earlier than it does other men; but he ascribes their cause of it to the temperament, which is, as he alleges, more tranquil. He recollects not the pathetic representation which he himself has exhibited of the scenes that their passions represent, when they expand and exalt themselves in the bosom of peace, in their national assemblies, where their harangues leave all the art of our Orators far behind, as to justness and sublimity or imagery; or amidst the fury of war, where they brave in the face of fire and faggots, all the rage of their enemies. He does not choose to see that it is our European education which destroys our temper, for he acknowledges in another place that these same Savages, brought up after our manner, become more wicked than others. These are passages in his Work, in which he presents the most effecting eulogium of their morality, of their amiable qualities, and of their happy life. He sometimes seems to envy their condition.

* Historical Journal of North America, Lett. xxiii. Aug. 1721.

Time permits me not to give at large those different passages that may be read in the Book from which the above extract is made, nor to produce a multitude of other testimonies respecting the different Nations of Asia, which demonstrate the imperceptible influence that gentleness of education has on the physical and moral beauty of mankind, and which must be, in every political constitution, the most powerful bond of Union among the members of the State.

I shall conclude these foreign authorities by a touch which good *John James Rousseau* could not have given with impunity, and which is extracted word for word from the work of a Dominican; I mean the agreeable History of the Antilles by Father *du Tertre*, a man replete with taste, with good sense and humanity. Hear what he says of the Caribs, whose education resembles that of the Nations which I have been describing.*

“On mentioning the word savage,” says he, “most people will figure to themselves a species of men, barbarous, cruel, inhuman, destitute of reason, deformed, tall as giants, hairy like bears; in a word, rather monsters than rational beings; though in truth our Savages are such only in name, just as the plants and the fruits which Nature produces without culture in forests and deserts; for these too we denominate wild or savage, though they possess the real virtues and properties in their native force and vigour, which we frequently corrupt by art, and cause to degenerate by transplantation into our gardens.—It is of importance,” adds he afterwards, “to demonstrate in this treatise, that the Savages in these islands are the most content, the happiest, *the least vicious*, the most sociable, the least deformed, and the least tormented by disease of any people in the world.”

If we trace among ourselves the history of a villain’s life, we shall find that his infancy was always very miserable. Wherever I have found children unhappy, I always observed they were wicked and ugly; and wherever I saw them happy, there likewise they were beautiful and good. In Holland and Flanders where they are brought up with the greatest gentleness, their beauty is singularly remarkable. It is from them that the famous sculptor, *Francis* the Flemish, borrowed his charming models

* Natural History of the Antilles, vol. ii. treatise vii. chap. 1. sect. 1.

of Children; and *Rubens* that freshness of colouring which glows on those of his pictures. You never hear them, as in our cities, uttering loud and bitter cries; still less do you hear them threatened with the rod by their mothers and nurses, as with us. They are not gay, but they are contented. You observe on their countenance an air of tranquillity and satisfaction which is perfectly enchanting, and infinitely more interesting than the boisterous mirth of our young people, when they are no longer under the eye of their fathers or preceptors.

This calmness is diffused over all their actions, and is the source of a happy composure which characterises their whole future life. I never saw any country where parental tenderness was so strikingly expressed. The children in their turn repay them, in their old-age the indulgence with which they were treated in helpless infancy. By bonds so endearing are these people attached to their country, and so powerfully, that we find very few of them settling among strangers. With us on the contrary, fathers like better to see children sprightly than good, because in a constitution of ambitious society, spirit raises a man to the head of a party, but goodness makes dupes. They have collections of epigrams composed by their children; but wit being only the preception of the relations of society, children scarcely ever have any but what is borrowed. Wit itself is frequently, in them, the proof of a miserable existence, as may be remarked in the school boys of our cities, who usually are sprightlier than the children of the peasantry; and in such as labour under some natural defect, as lameness, hunch-backedness and the like, who in respect of wit are still more premature than others. But in general they are all exceedingly forward in point of feeling; and this reflects great blame on those who degrade them at an age when they feel more delicately than men.

Of this I shall produce some instances calculated to demonstrate, that notwithstanding the defects of our political constitutions, there can exist in some families good natural qualities, or well informed virtues, which leave to the happy affections of children the liberty of expanding.

I was at Dresden in 1765, and happened to go the Court-Theatre: the piece performed was *The Father*. In came the Electress with one of her daughters, who might be about five or

six years of age. An officer of the Saxon guards who had introduced me, said in a whisper, "That child will interest you much more than the play." In fact, as soon as she had taken her seat, she rested both hands on the front of the box, fixed her eyes on the stage, and remained with open mouth, immoveably attentive to the performers. It was a truly affecting exhibition; her face, like a mirror, reflected all the different passions which the drama was intended to excite. You could see in succession, depicted upon it, anxiety, surprise, melancholy, sorrow; at last as the interest increased from scene to scene, the tears began to trickle copiously down her little cheeks; accompanied with shivering, sighing, sobbing: till it became necessary at length to carry her out of the box for fear of her being stifled. My companion informed me that as often as this young princess attended the representation of a pathetic piece, she was obliged to retire before it came to the crisis.

I have witnessed instances of sensibility still more affecting in the children of the common people, because they were not produced by any theatrical effect. As I was taking my walk some years ago, through the Pré St. Gervais, about the setting-in of winter, I observed a poor woman lying along the ground, employed in weeding a bed of sorrel; close by her was a little girl, of six years old at most, standing motionless and quite impurpled with the cold. I addressed myself to the woman, who betrayed evident symptoms of indisposition, and enquired into the nature of her malady. "Sir," said she to me, "for three months past, I have suffered very severely from the rheumatism; but my disease gives me much less pain than that poor child does: she will not quit me a single moment. If I say to her, see, you are quite benumbed with cold, go within doors and warm yourself; she replies, alas! mother, if I leave you, your complaints will be your only companion."

Another time, being at Marly, I went into that magnificent park, and amused myself in the woods with looking at the charming group of children who are feeding with vine boughs and grapes, a she-goat which seems to play with them. At no great distance is an enclosed pavilion, where *Louis XV.* in fine weather, sometimes went to enjoy a collation. Being caught in a sudden shower, I went in for a moment to shelter myself. I there found three children, who interested me much more than

the children in marble without doors. They were two little girls uncommonly handsome, employed with singular activity, in picking up round the arbour the scattered sticks of dry wood, which they deposited in a basket that stood on the King's table, while a little boy all in tatters, and extremely lean, was devouring a morsel of bread in a corner. I asked the tallest, who might be about eight or nine years old, what she intended to do with that wood, which she was busily collecting. She replied, "Look, Sir, at that poor boy there; he is very miserable! He is so unfortunate as to have a step-mother, who sends him out all day long to pick up wood: if he carries none home, he is beaten severely; when he happens to have got a little and is carrying it off, the Swiss at the park-gate takes it from him, and applies it to his own use. He is half dead with hunger, and we have given him our breakfast." Having thus spoken, she and her companions filled the little basket; helped him up with it on his back, and ran away before their unhappy friend to the gate of the park, to see if he could pass unmolested.

Foolish Instructors! Human nature, you tell us, is corrupted: yes, but you are the persons who corrupt it by contradictions, by unprofitable studies, by dangerous ambition, by shameful chastisements: and by an equitable re-action of divine Justice, that feeble and unfortunate generation will one day give back to that which oppresses it, in jealousies, in disputes, in apathies, and in oppositions of tastes, of modes, and of opinions, all the mischief which it first received.

I have explained, to the best of my ability, the causes and the re-actions of our evils, in the view of vindicating Nature from the charge of having produced them. I propose, at the close of this Work, to exhibit the palliatives and the remedies. They will no doubt prove vain and inefficient speculations: but if some Minister shall have the courage one day to undertake to render the Nation internally happy, and powerful abroad, I can venture to predict that this will be effected neither by plans of economy, nor by political alliances, but by reforming it's manners, and it's plan of education. He never will make good this revolution by means of punishments and rewards, but by imitating the processes of Nature, who always carries her point by re-action.

It is not to the apparent evil that the remedy must be applied, but to it's cause. The cause of the moral power of gold, is in the venality of public offices; that of the excessive superabundance of indolent tradesmen in our cities, is in the imposts which degrade the inhabitants of the country; that of the beggary of the poor, is in the overgrown property of the rich; that of the prostitution of young women, is in the celibacy of the men; that of the prejudices of the Nobility, in the resentments of the vulgar; and that of all the evils of society, in the torments inflicted on children.

For my own part, I have spoken out; and if I could have spoken to the Nation in one vast assembly, from some point of the Horizon where Paris is discernible, I would have pointed out to my Country, on the one part, the monuments of the rich; the thousands of voluptuous palaces in the suburbs, eleven theatres, the steeples of a hundred and thirty-four convents, among which arise eleven wealthy abbeys; those of a hundred and sixty other churches, twenty of which are richly endowed chapters: and, on the other part, I would have pointed out the monuments of the wretched; fifty-seven colleges, sixteen courts of justice, fourteen barracks, thirty guard-houses, twenty-six hospitals, twelve prisons or houses of correction. I would have displayed the magnificence of the gardens, of the courts, of the greens, of the inclosures, and of the dependencies, of all these vast edifices, accumulated on a space of ground less than a league and a half in diameter. I would have demanded, Whether the rest of the Kingdom is distributed in the same proportion as the Capital: Where is the property of those who supply it with food, with clothing, with the means of lodging, of those who defend it; and What, at last, is left for the multitude, to maintain citizens, fathers of families, and happy men? Oh! ye moral and political Powers, after having shewn you the causes and the effects of our evils, I would have prostrated myself at your feet, and would have expected, as the reward of truth, the same recompense which the peasant of the Danube expected from the insatiable powers of Rome.*

* As a sequel to this Study, may be read that on Education.

STUDY VIII.

REPLIES TO THE OBJECTIONS AGAINST A DIVINE PROVIDENCE,
AND THE HOPES OF A LIFE TO COME, FOUNDED ON THE IN-
COMPREHENSIBLE NATURE OF GOD, AND ON THE MISERIES
OF A PRESENT STATE.

“WHAT avails it me,” some one will say, “that my tyrants
“are punished, if I am still to be the victim of tyranny? Is it
“possible that such compensations should be the work of GOD?
“Great Philosophers, who have devoted their whole life to the
“study of Nature, have refused to acknowledge it’s Author.
“Who hath seen GOD at any time? What is it that constitutes
“God? But taking it for granted that an intelligent Being di-
“rects the affairs of this Universe, Man assuredly is abandoned
“to himself: no hand has traced his career: as far as he is con-
“cerned, there are, apparently, two Deities; the one inviting him
“to unbounded enjoyment, and the other dooming him to end-
“less privation; one God of Nature, and another GOD of reli-
“gion. Man is left totally uncertain whether of the two he is
“bound to please; and whatever be the choice which he is de-
“termined to make, how can he tell whether he is rendering
“himself an object of love or hatred?

“His virtue itself fills him with doubts and scruples; it ren-
“ders him miserable, both inwardly and outwardly; it reduces
“him to a state of perpetual warfare with himself, and with the
“world, to the interests of which he is obliged to make a sa-
“crifice of himself. If he is chaste, the world calls him impo-
“tent; if he is religious, he is accounted silly; if he discovers
“benignity of disposition to those around him, it is because he
“wants courage; if he devotes himself for the good of his
“country, he is a fanatic; if he is simple, he is duped; if he
“is modest, he is supplanted; he is every where derided, be-
“trayed, despised, now by the philosopher, and now by the
“devotee. On what foundation can he build the hope of a re-
“compense for so many struggles and mortifications? On a
“life to come? What assurance has he of it’s existence?
“Where is the traveller that ever returned from thence?

" What is the soul of man ? Where was it a hundred years
 " ago ? Where will it be a century hence ? It expands with the
 " senses, and expires when they expire. What becomes of it
 " in sleep, in a lethargy ? It is the illusion of pride to imagine
 " that it is immortal : Nature universally points to death, in
 " his monuments, in his appetites, in his loves, in his friend-
 " ships : Man is universally reduced to the necessity of draw-
 " ing a veil over this idea. In order to live less miserable, he
 " ought to *divert* himself, that is, as the word literally imports,
 " he ought to *turn aside* from that dismal perspective of woes
 " which Nature is presenting to him on every side. To what
 " hopeless labours has she not subjected his miserable life ?
 " The beasts of the field are a thousand times happier ; clothed,
 " lodged, fed by the hand of nature, they give themselves up
 " without solicitude to the indulgence of their passions, and
 " finish their career without any presentiment of death, and
 " without any fear of an hereafter.

" If there be a GOD who presides over the destiny of all, he
 " must be inimical to the felicity of the Human Race. What
 " is it to me that the Earth is clothed with vegetables, if I have
 " not the shade of a single tree at my disposal ? Of what im-
 " portance are to me the laws of harmony and of love, which
 " govern Nature, if I behold around me only objects faithless
 " and deceiving ; or if my fortune, my condition, my religion,
 " impose celibacy upon me ? The general felicity diffused over
 " the Earth, serves only as a bitter aggravation of my particu-
 " lar wretchedness. What interest is it possible for me to take
 " in the wisdom of an arrangement which renovates all things,
 " if, as a consequence of that very arrangement, I feel myself
 " sinking, and ready to be lost for ever ? One single wretch
 " might arraign Providence, and say with *Job*, the Arabian : *
 " *Wherefore is light given to him that is in misery, and life unto*
 " *the bitter in soul ?* Alas ! The appearances of happiness have
 " been disclosed to the view of Man, only to overwhelm him
 " with despair of ever attaining it. If a GOD, intelligent and
 " beneficent, governs Nature, diabolical spirits direct and con-
 " found at least the affairs of the children of men."

* *Job*. chap. iii. verse 20.

I shall first reply to the principal authorities on which some of these objections are supported. They are extracted, in part, from a celebrated Poet, and a learned Philosopher, namely, *Lucretius* and *Pliny*.

Lucretius has clothed the philosophy of *Empedocles* and *Epicurus* in very beautiful verses. His imagery is enchanting ; but that Philosophy of atoms, which adhere to each other by chance, is so completely absurd, that wherever it appears, the beauty of the poetry is impaired. For the truth of this, I confidently refer to the judgment of his partisans themselves. It speaks neither to the heart nor to the understanding. It offends equally in it's principles, and in the consequences deduced from them. To what, we may ask him, do those primary atoms, out of which you construct the elements of Nature, owe their existence? Who communicated to them the first movement? How is it possible they should have given to the aggregation of a great number of bodies, a spirit of life, a sensibility, and a will, which they themselves possessed not?

If you believe, with *Leibnitz*, that those *monads*, or unities, have, in truth, perceptions peculiar to themselves, you give up the laws of chance, and are reduced to the necessity of allowing to the elements of nature, the intelligence which you refuse to it's AUTHOR. *Descartes* has, in truth, subjected those impalpable principles, and, if I may be allowed the expression, that metaphysical dust to the laws of an ingenious Geometry ; and after him, the herd of Philosophers, seduced by the facility of erecting all sorts of systems with the same materials, have applied to them, by turns, the laws of attraction, of fermentation, of crystallization ; in a word, all the operations of Chemistry, all the subtilties of dialectics : but all with equal success, that is with none whatever. We shall demonstrate, in the article which follows this, when we come to speak of the weakness of Human Reason, that the method adopted in our Schools, of rising up to first causes, is the perpetual source of the errors of our Philosophy, in physics as well as in morals. Fundamental truths resemble the stars, and our reason is like the graphometer. If this instrument, constructed for the purpose of observing the heavenly bodies, has been deranged however slightly ; if from the point of departure, we commit a mistake

of the minutest angle imaginable, the error, at the extremity of the visual rays, becomes absolutely incommensurable.

There is something still more strange in the method which *Lucretius* has thought proper to pursue; namely, that in a Work, the professed object of which is to materialize the Deity, he sets out with deifying matter. In this he has himself given way to an universal principle, which we shall endeavour to unfold, when we come to adduce the proofs of the Divinity from feeling: it is this, that we find it impossible powerfully to interest mankind, whatever be the object, without presenting to the Mind some of the attributes of Deity. Before he attempts, therefore, to dazzle the understanding, as a Philosopher, he begins with setting the heart on fire, as a Poet. Here is a part of his exordium.

.....Hominum divumque voluptas,
Alma *Venus*, cœli subter labentia signa
Quæ mare navigerum, quæ terras frugiferentes
Concelebras, per te quoniam genus omne animantum
Concipitur, visitque exortum lumina solis,
Te dea, te fugiunt venti, te nubila cœli,
Adventuque tuo, tibi suaves dædala tellus
Submittit flores, tibi rident æquora ponti,
Placatumque nitet diffuso lumine cælum.

.
Quæ quoniam rerum naturam sola gubernas,
Nec, sine te, quidquam dias in luminis oras
Exoritur, neque sit lætum, neque amabile quidquam,
Te sociam studeo scribendis versibus esse,
Quos ego de rerum natura pangere conor.

.
Quo magis æternum, da dictis, diva, leporem.
Effice ut in terra fera munera militiæ
Per maria ac terras omnes sopita quiescant;
Nam tu sola potes tranquilla pace juvare
Mortales, quoniam belli fera munera Mavors.
Armipotens regit, in gremium qui sæpe tuum se
Rejicit, æterno devictus vulnere amoris.

.
Hunc, tu diva, tuo recubantem corpore sancto
Circumfusa super, suaves ex ore loquelas
Funde, petens placidam Romanis, inclyta pacem:
Nam neque nos agere, hoc patriæ tempore iniquo,
Possumus æquo animo.

Du Rerum Natura, lib. 1.

I shall endeavour, as well as I can, to give a plain prose translation of those beautiful verses.

“ ————Delight of men and gods, gracious *Venus!* who
 “ presidest over the sail-bearing Ocean, and the fertile Earth,
 “ while the hosts of Heaven glide majestically silent around ;
 “ since by thy prolific virtue, the whole animal creation teems
 “ with life, and turns the opening eye-ball to the light of the
 “ Sun ; at thy approach, O Goddess, the winds are hushed, the
 “ vapours that obscure the face of the sky disperse, the varie-
 “ gated ground spreads a carpet of enamelled flowers under-
 “ neath thy feet ; the waters of the deep smile with joy, and
 “ the placid sky is overspread with a milder light.—See-
 “ ing, then, that thou reignest sole Empress of Nature ; since
 “ without thee no living creature rises into day, or possesses the
 “ capacity of receiving or communicating delight, how gladly
 “ would I assume thee as my associate in the arduous under-
 “ taking on which I now enter—an enquiry into the nature of
 “ things.—Give, then, O Goddess, somewhat of thy unfading
 “ grace to my strains. And grant, meanwhile, that the din of
 “ battle may cease over every land, over every sea : for with
 “ thee it rests to reduce the troubled world to peace ; since
 “ *Mars*, all-powerful in arms, directs the thunder of war ; who
 “ frequently retires well-pleased from the ensanguined plain, to
 “ solace himself in the soft dalliance of thy uncloying love.—
 “ In those fond moments, when affection can deny nothing, in-
 “ treat him to have compassion on his own Rome and thine,
 “ and bestow on it lasting tranquillity ; for how can the voice of
 “ the philosophic Muse be heard amidst the confused noise of
 “ civil discord ?”*

* Mr. *Creech* and Mr. *Dryden* have both translated this passage of *Lucretius*. It would have saved me a little labour, had I dared to transcribe from either of their poetical versions. But, every thing considered, I have ventured rather to hazard one of my own. If it shall be deemed deficient in poetical merit, two qualities, at least, it possesses ; it conveys enough of the sense of the Original, to answer the purpose of it's being quoted in this Work, and it cannot possibly give offence to any modest ear.

VENUS, all hail ! of Gods and men the pride ;
 Mov'd by whose pow'r, the heav'nly bodies glide
 In mystic round ; thine is the teeming Earth ;
 To thee the swelling Ocean owes his birth :

Lucretius is, in truth, constrained to admit, in the sequel of his Poem, that this goddess, so wonderfully beneficent, is directly chargeable with the ruin of health, of fortune, of parts, and, sooner or later, with the loss of reputation: that from the very lap of the pleasures which she bestows, there issues a something which embitters enjoyment, which torments a man, and renders him miserable. The unfortunate Bard himself fell a victim to this, for he died in the very prime of life, either from excessive indulgence, according to some, or poisoned, according to others, by an amorous potion administered by the hand of a woman.

In the passage above quoted, he ascribes to *Venus* the creation of the world; he addresses prayers to her; he bestows on her person the epithet of sacred; he invests her with a character of goodness, of justice, of intelligence, and of power, which be-

Source of all life! thou breath'st the living soul,
And kindest joy "from Indus to the Pole."
At thy approach the noisy tempests cease,
The air grows pure, and all the World is peace;
For thee the *SPRING* her flow'ry mantle waves,
For thee *AUTUMNUS* piles his golden sheaves;
The placid Deep reflects a clearer ray,
And *SOL* emits through Heaven a brighter day.

.
Since Goddess, thus all own thy sov'reign pow'r;
Since, without thee, none sees the natal hour;
Without thee nought of fair, of sweet, is seen,
Delight of Nature! Universal queen!
Visit thy bard with some celestial dream
Be thou my Muse, for Nature is my theme.

.
Around my lays thy winning graces shed,
So shall immortal honours crown my head.

Meanwhile, command a troubled world to rest,
Bid the fierce soldier calm his angry breast.
Let Sea and Land thy genial influence feel;
Let placid Nations at thine altar kneel.
Besmear'd with blood, and sick of war's alarms:
Soothe back fierce *MARS* to thy all-conq'ring arms:
Tell him how Rome now bleeds at every vein;
Let thy sweet voice restore the gentle reign
Of golden *SATURN*. Bid the trumpet cease,
Let all in *ROME*, and all the *WORLD* be peace.—H. H.

longs to GOD only ; in a word, the attributes are so exactly the same, that, suppressing only the word *Venus*, in the invocation of his Poem, you may apply it almost entirely to the Divine Wisdom. There are even points of resemblance, so striking, to the representation given of it in the Book of Ecclesiasticus, that I cannot refrain from exhibiting the counterpart, that the Reader may have it in his power to make the comparison.

Ecclesiastes, chap. xxiv.

Fulgate Latin Version.

3, 4, 5, Ego ex ore Altissimi prodivi, primogenita ante omnem creaturam ; ego feci in cœlis ut oritur lumen indeficiens, & sicut nebula texi omnem terram. Ego in altissimis habitavi, & thronus meus in columna nubis.

6, 7, 8, 9, Gyrum cœli circuii sola, & profundum abyssi penetraui ; in fluctibus ambulavi, et in omnia terra steti & in omni populo ; & in omni populo primatum habui. Et omnium excellentium & humilium corda virtute calcavi, & in his omnibus requiem pœsivi, et in hæreditate domini morabor.

Common English Version.

3. I came out of the mouth of the Most High, and covered the Earth as a cloud.

4. I dwelt in high places, and my throne is a cloudy pillar.

5. I alone compassed the circuit of Heaven ; and walked in the bottom of the Deep.

6. In the waves of the sea, and in all the earth, and in every people and nation, I got a possession.

7. With all these I sought rest : and in whose inheritance shall I abide ?

13. Quasi cedrus exaltata sum in Libano, & quasi cypressus in Monte Sion.

14. Quasi palma exaltata sum in Cades, & quasi plantatio rosæ in Jerico. Quasi oliva speciosa in campis, et quasi platanus exaltata sum juxta aquam in plateis.

16. Ego quasi terebinthus extendi ramos meos, & rami mei honoris & gratiæ.

17. Ego quasi vitis fructificavi suavitatem odoris, & flores mei fructus honoris & honestatis.

18. Ego mater pulchræ dilectionis, et timoris, & agnitionis, & sanctæ spei. In me gratia omniû viæ et veritatis, in me omnis spes vitæ et virtutis.

13. I was exalted like a cedar in Libanus, and as a cypress-tree upon the mountains of Hermon.

14. I was exalted like a palm-tree in Engaddi, and as a rose-plant in Jerico, as a fair olive-tree in a pleasant field, and grew up as a plane-tree by the water.

16. As the turpentine tree, I stretched out my branches, and my branches are the branches of honour and grace.

17. As the vine brought I forth pleasant savour, and my flowers are the fruit of honour and riches.

18. I am the mother of fair love, and fear, and knowledge, and holy hope : I therefore being eternal, am given to all my children which are named of him.

19. *Transite ad me, omnes qui concupiscitis me, & generationibus meis implemini.*

20. *Spiritus enim meus super mel dulce, et hæreditas mea super mel & favum.*

19. Come unto me, all ye that be desirous of me, and fill yourselves with my fruits.

20. For my memorial is sweeter than honey, and mine inheritance than the honey-comb.

“ Out of the mouth of the ALMIGHTY proceeded I. Before
 “ any created being knew that it existed, I was. If there be in
 “ Heaven a light never to be extinguished, I commanded it to
 “ arise. If the Earth is involved in clouds, I commanded the
 “ vapour to ascend. The lofty places of the Earth are my ha-
 “ bitation; and my throne is in the cloudy pillar. In solitude
 “ I make the round of the starry Heavens; I plunge to the bot-
 “ tom of the vast abyss, and walk majestic under the waves of
 “ the Sea. On every land the sole of my foot alights, and I
 “ travel from shore to shore. Wherever I appear, my sove-
 “ reignty is acknowledged. In the greatness of my might, I
 “ have subdued the heart of the humble and of the proud. I
 “ have sought for a place of habitation in the midst of them; but
 “ I will fix mine abode only in the heritage of *JEHOVAH*....I
 “ have lifted up myself as a cedar upon Mount Lebanon, and
 “ as a cypress tree on the hills of Zion. My branches have
 “ been exalted to the Heavens, like the palm-trees of Kadish,
 “ and as the blossoms of the rose which surround Jericho. I am
 “ beautiful as the olive on the brow of the hill, and majestic as
 “ the plane-tree, in an open place, by the fountains of water....
 “ I have extended my boughs as the terebinthus; my branches
 “ are branches of honour and grace. I have put forth, as the
 “ vine, blossoms of the sweetest perfume, and my buds have
 “ produced the fruits of glory and abundance. I am the parent
 “ of holy love, of fear, of knowledge, and of sacred hope; I
 “ alone point out the road that is safe and easy; and unfold
 “ truths that give delight; in me reposes all the expectation of
 “ life and virtue. Come to me, all ye who love me; and my
 “ never-ceasing productions shall fill you with rapture; for my
 “ spirit is sweeter than honey, and my distribution of it far supe-
 “ rior to the cells of the honey-comb.”

This feeble translation is after the Latin prose version, itself a translation from the Greek, and it again from the Hebrew. It is not to be doubted, therefore, that in passing through so many

strainers, much of the grace of the original must have evaporated. But even as it is, it possesses a decided superiority, in respect of pleasantness and sublimity of imagery, over the verses of *Lucretius* who appears to have borrowed his principal beauties from this passage. And here I dismiss that Poet: the exordium of his performance is a complete refutation of it.

Pliny takes the directly opposite course. In the very threshold of his *Natural History* he affirms that there is no GOD, and the whole of that work is an elaborate demonstration of the being of GOD. His authority must necessarily be of considerable weight, as it is not that of a Poet, to whom opinions are a matter of indifference, provided he can produce a striking picture; nor that of a sectary, obstinately determined to support a party, whatever violence may be done to conscience; nor, finally, that of a flatterer, making his court to vicious Princes. *Pliny* wrote under the virtuous *Titus*, and has dedicated his book to him. He carries to such a height the love of truth, and contempt of the glory of the age in which he lived, as to condemn the victories of *Cesar*, in Rome itself, and when addressing a Roman Emperor. He is replete with humanity and virtue. He frequently exposes to censure the cruelty of masters to their slaves, the luxury of the great, nay, the dissolute conduct of several Empresses. He sometimes pronounces the panegyric of good men; and exalts even above the inventors of arts, persons who have rendered themselves illustrious by their continency, their modesty, and their piety.

His Work, in other respects, is a combination of brilliancies. It is a real Encyclopedia, which contains, as it ought, the history of the knowledge, and of the errors of his time. These last are sometimes imputed to him very unjustly, for he frequently brings them forward merely in the view of refuting them. But he has been abused by the Physicians, and the Apothecaries, who have extracted the greatest part of their prescriptions from him, because he finds fault with their conjectural art, and with their systematic spirit. He abounds, besides, in curious information, in profound views, and interesting traditions; and, what renders his performance invaluable, he uniformly expresses himself in a picturesque manner. With all this taste, judgment, and knowledge, *Pliny* is an atheist. Nature, from whose capacious stores he has derived such various intelligence, may ad-

dress him in the words of *Cesar* to *Brutus*: *What, you too, my son!*

Pliny I love, and I esteem:* and if I may be permitted to say in his justification, what I think of his immortal Work, I believe it to be falsified in the passage where he is made to reason as an atheist. All his commentators agree in thinking, that no one Author has suffered more from the unfaithfulness of transcribers than he has done; and this to such a degree, that copies of his *Natural History* exist, in which there are whole chapters entirely different. Consult, among others, what *Mathiolla* says on the subject, in his commentaries on *Dioscorides*. I shall here take occasion to observe, that the Writings of the Ancients, on their way to us, have passed through more than one unfaithful language, and what is much worse, through more than one suspicious hand. They have met with the fate of their monuments, among which their temples have been most of all degraded. Their books have, in like manner, been mutilated chiefly in those passages which are favourable to religion, or the reverse. An instance of this we have in the transcription of *Cicero's* Treatise on the Nature of the Gods, in which the objections against Providence are omitted.

Montagne upbraids the first Christians with having suppressed, on account of four or five articles which contradicted their creed, a part of the Works of *Cornelius Tacitus*, "though," says he, "the Emperor *Tacitus*, his relation, had by express edicts furnished all the libraries in the World with them."†

In our own days, do we not see how every party exerts itself to run down the reputation, and the opinions of the party which opposes it? Mankind is, in the hands of religion and philosophy,

* I am much pleased with *St. Pierre's* eulogium on *Pliny*. I think him by far the most valuable of all the latin authors that have descended to us: and I have often expressed my wish to see the *Naturalis Historiæ* introduced into our schools, as a classical work, for the higher forms. Would it not be much better that our young men, whether destined to the pulpet, the law, medicine, or even for the counting house, or the pursuits of agriculture, should employ a few months of their time in reading certain parts of *Pliny*, who would be continually impressing upon their minds some important practical matter, than in reading through the odes, and other writings of *Horace*, whom few, before the age of twenty have taste to relish; and of whom very few at the end of two or three years after they have left their schools remember fifty lines.—B. S. B.

† *Essays*, book ii, chap. xix.

like the old man in the fable, between two dames of different ages. They had both a mind to trim his locks, each in her own way. The younger picked carefully out all the white hairs, which she could not bear; the old one, for an opposite reason, as carefully removed the black: the consequence was, his head was speedily reduced to complete baldness.

It is impossible to adduce a more satisfactory demonstration of this ancient infidelity of the two parties, than an interpolation to be found in the writings of *Flavius Josephus*, who was contemporary with *Pliny*. He is made to say, in so many words, that the Messiah was just born; and he continues his narration, without referring so much as once to this wonderful event, to the end of a voluminous history. How can it be believed that *Josephus*, who frequently indulges himself in a tedious detail of minute circumstances, relating to events of little importance, should not have reverted a thousand and a thousand times, to a birth so deeply interesting to his Nation, considering that it's very destiny was involved in that event, and that even the destruction of Jerusalem was only one of the consequences of the death of JESUS CHRIST? He, on the contrary, perverts the meaning of the prophecies which announce Him, applying them to *Vespasian* and to *Titus*; for he, as well as the other Jews, expected a Messiah triumphant. Besides, had *Josephus* believed in CHRIST, would he not have embraced his Religion?

For a similar reason is it credible that *Pliny* should commence his Natural History with denying the existence of GOD, and afterwards fill every page of it, with expatiating on the wisdom, the goodness, the providence, the majesty of Nature; on the presages and pre-monitions, sent expressly from the God's: and even on the miracles divinely operated through the medium of dreams?

Certain savage tribes have likewise been adduced as affording examples of atheism, and every sequestered corner of the Globe has been for this purpose explored. But obscure remote tribes were no more intended to serve as an example to the human race, than certain mean and obscure families among ourselves, could be proposed as proper models to the Nation; especially when the professed object is to support, by authority, an opinion which is necessarily subversive of all society. Besides, such assertions are absolutely false. I have read the history of the

voyages from which they are extracted. The travellers acknowledge that they had but a transient view of those people, and that they were totally unacquainted with their languages. They took it for granted that there could be no religion among them, because they saw no temples; as if any other temple were necessary to a belief in God than the temple of Nature! These same travellers likewise contradict themselves; for they relate, that those Nations, whom they elsewhere represent as destitute of all religion, make obeisance to the Moon, at the change, and when full, by prostrating themselves to the Earth, or by lifting up their hands to Heaven: that they pay respect to the memory of their fore-fathers, and place viands on their tombs. The immortality of the soul, admitted in whatever manner you will, necessarily supposes the existence of GOD.

But if the first of all truths stood in need of testimony from men, we could collect that of the whole Human Race, from geniuses the most exalted, down to the lowest state of ignorance. This unanimity of testimony is of irresistible weight; for it is impossible that such a thing should exist on the Earth as universal error.

Hear what the sage *Socrates* said to *Euthydemus*, who expressed a wish to have a complete assurance that the Gods existed:

“ Know, assuredly, that I told you the truth,* when I declared the existence of the Gods, and asserted that Man is their peculiar care: but expect not that they should assume a sensible appearance, and present themselves before you; satisfy yourself with the contemplation of their works, and with paying them adoration; remember that this is the way in which they make themselves known unto men: for of all the heavenly powers whose liberality towards us is so great, no one ever becomes the visible dispenser of his own bounty; and the great GOD himself, who created the Universe, and who sustains that vast fabric, all the parts of which are adjusted in perfect beauty and goodness; He who constantly watches over it, and takes care that it shall not wax old, and fall into decay through length of duration, but always subsist in immortal vigour; † He who also, with power uncontrolla-

* *Xenophon's* Memorable Things of *Socrates*, book iv.

† *Socrates* had made a particular study of Nature; and although his judgment, respecting the duration and preservation of her works may be contrary

“ ble constrains the whole to obey his will ; and that with a promptitude which far surpasses our imagination: He, I say, is abundantly visible in all those wonders of which He is the AUTHOR. But let our eyes attempt to penetrate to his throne, and to contemplate all these mighty operations in their source, here He must be ever invisible.

“ Observe, for a moment, that the Sun, who seems designedly exposed to the view of the whole Creation, permits no one, however, steadily to behold him: the man who dares to make the rash attempt is instantly punished with blindness. Nay, more, every instrument employed by the Gods is invi-

to that of our philosophy, which considers the globe of the Earth, especially as in a progressive state of ruin, it is in perfect harmony with that of the Holy Scriptures which gives us positive assurance that GOD upholds it, and with our own experience on the subject, as I have already shewn. We have little reason to undervalue the physical knowledge of the Ancients, except in so far as it was reduced to system. We ought to recollect that they had made most of the discoveries which the moderns boast as all their own. The Tuscan Philosophers understood the art of conjuring down the thunder. Good King *Numa* made experiments on this subject. *Tullus Hostilius* took a fancy to imitate, but fell a victim to his attempt, from want of understanding how to conduct the experiment in a proper manner. (Consult *Plutarch*). *Philolaus*, the Pythagorean, advanced long before *Copernicus*, that the Sun was the centre of the World ; and before *Christopher Columbus*, that our earth consisted of two Continents, that on which we are placed, and the one opposite to it. Several Philosophers of Antiquity maintained, that comets were stars which pursued a regular course. *Pliny* himself says, that they all move in a northerly direction, which is generally true. It is not yet, however, two hundred years, since comets were believed in Europe, to be vapours which caught fire in the intermediate regions of the air. The general belief, about that period, likewise was, that the Sea furnished a supply of water to the fountains and rivers, by a process of filtration through the pores of the Earth, though it is said in a hundred passages of Scripture, that by the rains their sources are kept flowing. Of this we now have the most complete conviction, by accurate observations on the evaporations of the Ocean. The monuments which the Ancients have transmitted to us in Architecture, Sculpture, Poetry, Tragedy, History, will ever serve as models to us. We are indebted to them besides for the invention of almost all the other Arts ; and it is presumable that these Arts had the same superiority over ours, which their liberal Arts have. As to the natural Sciences they have not left us any objects of comparison ; besides the Priests, who were chiefly employed in the cultivation of them, carefully concealed their knowledge from the People. There is little room to doubt that they possessed, on this subject an illumination far transcending ours. Consult what the judicious Sir *William Temple* has said of the magic of the ancient Egyptians.

“sible. The thunder is darted from on high; it dashes in pieces every thing it meets; but no one can see it fall, can see it strike, can see it return. The winds are invisible, though we see well the ravages which they every day commit, and feel their influence the moment that they begin to blow. If there be any thing in Man that partakes of the divine Nature, it is his soul. There can be no doubt that this is his directing, governing principle, nevertheless it is impossible to see it. From all this be instructed not to despise things invisible: be instructed to acknowledge their powers in their effects, and to honour the DEITY.”

Newton, who pursued his researches into the Laws of Nature so profoundly, never pronounced the name of GOD without moving his hat, and otherwise expressing the most devout respect. He took pleasure in recalling this sublime idea, even in his moments of conviviality, and considered it as the natural bond of union among all Nations. *Corneille le Bruyn*, the Dutch painter, relates, that happening to dine one day at his table, in company with several other foreigners, *Newton*, when the desert was served up, proposed a health to the Men of every Country who believed in GOD. This was drinking the health of the Human Race. Is it possible to conceive that so many Nations, of languages and manners so very different, and, in many cases, of an intelligence so contracted, should believe in GOD, if that belief were the result of some tradition, or of a profound metaphysical disquisition? It arises from the spectacle of Nature simply. A poor Arabian of the Desert, ignorant as most of the Arabians are, was one day asked, How he came to be assured that there was a God? “In the same way,” replied he, “that I am able to tell, by the print impressed on the sand, whether it was a man or a beast which passed that way.”*

It is impossible for Man, as has been said, to imagine any form, or to produce a single idea of which the model is not in Nature. He expands his reason only on the reasons which Nature has supplied. GOD must, therefore, necessarily exist, were it but for this, that Man has an idea of Him. But if we attentively consider, that every thing necessary to Man, exists in a most wonderful adaptation to his necessities, for the strongest

* Travels through Arabia, by Mons. d'Arvieux.

of all reasons, GOD likewise must exist, He who is the universal adaptation of all the societies of the Human Race.

But I should wish to know, In what way the person who doubts of his existence, on a review of the Works of Nature, would desire to be assured of it? Do they wish that he should appear under a human form, and assume the figure of an old man, as he is painted in some of our churches? They would say, This is a man. Were he to invest himself with some unknown and celestial form, Could we in a human body support the sight? The complete and unveiled display of even a single one of his works on the Earth, would be sufficient to confound our feeble organs. For example, if the Earth wheels around it's axis, as is supposed, there is not a human being in existence, who, from a fixed point in the Heavens, could view the rapidity of it's motion without horror; for he would behold rivers, oceans, kingdoms, whirling about under his feet, with a velocity almost thrice as great as a cannon ball. But even the swiftness of this diurnal rotation is a mere nothing: for the rapidity with which the Globe describes it's annual circle, and whirls us round the Sun, is seventy-five times greater than that of a bullet shot from the cannon. Were it but possible for the eye to view through the skin, the mechanism of our own body, the sight would overwhelm us. Durst we make a single movement, if we saw our blood circulating, the nerves pulling, the lungs blowing, the humours filtrating, and all the incomprehensible assemblage of fibres, tubes, pumps, currents, pivots, which sustain an existence at once so frail and so presumptuous?

Would we wish, on the contrary, that GOD should manifest himself in a manner more adapted to his own nature, by the direct and immediate communication of his intelligence, to the exclusion of every intervenient mean?

Archimedes, who had a mind capable of such intense application, as not to be disturbed from his train of thought, by the sack of Syracuse, in which he lost his life, went almost distracted, from the simple perception of geometrical truth, of which he suddenly caught a glimpse. He was pondering, while in the bath, the means of discovering the quantity of alloy which a rascally goldsmith had mixed in *Hiero's* golden crown; and having found it, from the analogy of the different weight of his own body, when in the water, and out of it, he

sprung from the bath, naked as he was, and ran like a madman through the streets of Syracuse, calling out *I have found it ! I have found it !*

When some striking truth, or some affecting sentiment, happens to lay hold of the audience at a theatre, you see some melted into tears, others almost choked with an oppressed respiration, others quite in a transport, clapping their hands, and stamping with their feet ; the females in the boxes actually fainting away. Were these violent agitations of spirit to go on progressively but for a few minutes only, the persons subject to them might lose their reason, perhaps their life. What would be the case, then, if the Source of all truth, and of all feeling, were to communicate himself to us in a mortal body ? GOD has placed us at a suitable distance from his infinite Majesty ; near enough to have a perception of it, but not so near as to be annihilated by it. He veils his intelligence from us under the forms of matter ; and He restores our confidence respecting the movements of the material world by the sentiment of his intelligence. If at any time he is pleased to communicate himself in a more intimate manner, it is not through the channel of haughty Science, but through that of modest Virtue. He discloses himself to the simple, and hides his face from the proud.

“ But,” it is asked, “ What made GOD ? Why should “ there be a God ? ” Am I to call in question his existence, because I am incapable of comprehending his origin ? This style of reasoning would lead us to conclude, that man does not exist : for, Who made men ? Why should there be men ? Why am I in the world in the eighteenth century ? Why did I not arrive in some of the ages which went before ? and, Wherefore should I not be here in those which are to come ? The existence of GOD is at all times necessary, and that of Men is only contingent. Nay, this is not all ; the existence of Man is the only existence apparently superfluous in the order established upon the Earth. Many islands have been discovered without inhabitants, which presented abodes the most enchanting, from the disposition of the valleys, of the waters, of the woods, of the animals. Man alone deranges the plans of Nature : he diverts the current from the fountain ; he digs into the side of the hill : he sets the forest on fire ; he massacres

without mercy every thing that breathes ; every where he degrades the Earth, which could do very well without him.

The harmony of this Globe would be partially destroyed, perhaps entirely so, were but the smallest, and seemingly most insignificant, genus of plants to be suppressed ; for it's annihilation would leave a certain space of ground destitute of verdure, and thereby rob of it's nourishment the species of insect which there found the support of life. The destruction of the insect, again, would involve that of the species of bird, which in these alone finds the food proper for their young ; and so on to infinity. The total ruin of the vegetable and animal kingdoms might take it's rise from the failure of a single moss, as we may see that of an edifice commence in a small crevice. But if the Human Race existed not, it would be impossible to suppose that any thing had been deranged : every brook, every plant, every animal would always be in it's place. Indolent and haughty Philosopher, who presumest to demand of Nature, wherefore there should be a God, why demandest thou not rather wherefore there should be men ?

All his Works speak of their AUTHOR. The plain which gradually escapes from my eye, and the capacious vault of Heaven which encompasses me on every side, convey to me an idea of his immensity ; the fruits suspended on the bough within reach of my hand, announce his providential care ; the constant revolution of the seasons displays his wisdom ; the variety of provision which his bounty makes, in every climate, for the wants of every thing that lives, the stately port of the forests, the soft verdure of the meadow, the grouping of plants, the perfume and enamel of flowers, an infinite multitude of harmonies, known and unknown, are the magnificent languages which speak of HIM to all men, in a thousand and a thousand different dialects.

Nay, the very order of Nature is superfluous : GOD is the only Being whom disorder invokes, and whom human weakness announces. In order to attain the knowledge of his attributes, we need only to have a feeling of our own imperfections. Oh ! how sublime is that prayer,* how congenial to the heart of

* See *Flacourt's History of the Island of Madagascar*, chap. xliv. page 182. You will there find this prayer, embarrassed with many circumlocutions, but conveying the meaning which I have expressed. It is wonderfully strange

Man, and still in use among People whom we presume to call Savages ! “ O Eternal ! Have mercy upon me, because I am “ passing away : O Infinite ! because I am but a speck : O “ Most mighty ! because I am weak : Oh Source of Life ! be- “ cause I draw nigh to the grave : O Omniscient ! because I “ am in darkness : O All-bounteous ! because I am poor : O “ All-sufficient ! because I am nothing.”

Man has given nothing to himself : he has received all. And “ He who planted the ear, shall He not hear ? He who “ formed the eye, shall He not see ? He who teacheth Man “ knowledge, shall not He know ? ” I should consider myself as offering an insult to the understanding of my Reader, and should derange the plan of my Work, were I to insist longer on the proofs of the existence of GOD. It remains that I reply to the objections raised against his goodness.

It needs must be, we are told, that the God of Nature should differ from the God of Religion, for their laws are contradictory. This is just the same thing with saying, that there is one God of metals, another God of plants, and another of animals, because all these beings are subjected to laws peculiar to themselves. Nay, in all the kingdoms of Nature, the *genera* and the *species* have other Laws besides, which are peculiar to them, and which, in many cases, are in opposition among themselves ; but those different Laws constitute the happiness of each species in particular ; and they concur, in one grand combination, in a most admirable manner, to promote the general felicity.

The Laws which govern Man are derived from the same plan of Wisdom which has constructed the Universe. Man is not a being of a nature perfectly simple. Virtue, which ought to be the great object of his pursuit on the Earth, is an effort which he makes over himself, for the good of Mankind, in the view of pleasing GOD only. It proposes to him, on the one hand, the Divine Wisdom as a model ; and presents

that Negroes should have discovered all the attributes of Deity, in the imperfections of Man. It is with just reason that the Divine Wisdom has said of itself, that it rested on all Nations : *Et in omni terra steti, & in omni populo ; & in omni populo primatum habui.* In every land, among every people, I fixed my station ; and obtained the chief place amidst the Nations. ECCLES. chap. xxiv.

to him, on the other, the most secure and unerring path to his own happiness. Study Nature, and you will perceive that nothing can be more adapted to the felicity of Man, and that Virtue carries her reward in her bosom, even in this world. A man's continency and temperance secure his health; contempt of riches and glory insures his repose: and confidence in GOD supports his fortitude. What can be more adapted to the condition of a creature exposed to so much misery, than modesty and humility? Whatever the revolutions of life may be, that man has no farther fear of falling, who has taken his seat on the lowest step.

Let us not complain that GOD has made an unfair distribution of his gifts, when we see the abundance and the state in which some bad men live. Whatever is on the Earth most useful, most beautiful, and the best, is within the reach of every man. Obscurity is much better than glory, and virtue than talents. The light of the Sun, a little field, a wife and children, are sufficient to supply a constant succession of pleasures to him. Must he have luxuries too? A flower presents him colours more lovely than the pearl dragged from the abysses of the Ocean; and a burning coal on his hearth has a brighter lustre, and beyond all dispute is infinitely more useful, than the famous gem which glitters on the head of the Grand Mogul.

After all, What did GOD owe to every man? Water from the fountain, a little fruit, wool to clothe him, as much land as he is able to cultivate with his own hands. So much for the wants of his body. As to those of the soul, it is sufficient for him to possess, in infancy, the love of his parents; in maturity, that of his wife; in old age, the gratitude of his children; at all seasons, the good-will of his neighbours, the number of whom is restricted to four or five, according to the extent and form of his domain; so much knowledge of the Globe as he can acquire by rambling about for half a day, so as to get home to his own bed at night, or, at most, to the extremity of his domestic horizon; such a sense of Providence as Nature bestows on all men, and which will spring up in his heart fully as well after he has made the circuit of his own field, as after returning from a voyage round the World.

With corporeal enjoyments, and mental gratifications like these, he ought to be content; whatever he desires beyond

these, is above his wants, and inconsistent with the distributions of Nature. It is impossible for him to acquire superfluity but by the sacrifice of some necessary ; public consideration he must purchase at the price of domestic happiness ; and a name in the world of science by renouncing his repose. Besides, those honours, those attendants, those riches, that submission which men so eagerly hunt after, are desired unjustly. A man cannot obtain them but by plundering and enslaving his fellow-citizens. The acquisition of them exposes to incredible labour and anxiety, the possession is disturbed by incessant care, and privation tears the heart with regret. By pretended blessings such as these, health, reason, conscience, all is depraved and lost. They are as fatal to Empires as to families : it was neither by labour, or indigence ; no, not even by wars, that the Roman Empire fell into ruin ; but by the accumulated pleasures, knowledge, and luxury of the whole Earth.

Virtuous persons, in truth, are sometimes destitute not only of the blessings of Society, but of those of Nature. To this I answer, that their calamities frequently are productive of unspeakable benefit to them. When persecuted by the World, they are frequently, they are usually, incited to engage in some illustrious career. Affliction is the path of great talents, or, at least, that of great virtues, which are infinitely preferable. "It is not in your power," said *Marcus Aurelius*, "to be a Naturalist, a Poet, an Orator, a Mathematician ; but it is in your power to be a virtuous man, which is best of all."

I have remarked, besides, that no tyranny starts up, of whatever kind, respecting either facts or opinions, but a rival tyranny instantly starts up in opposition, which counterbalances it ; so that virtue finds a protection from the very efforts made by vice to oppress and crush it. The good man frequently suffers : it is admitted ; but if Providence were to interpose for his relief, as soon as he needed it, Providence would be at his disposal : in other words, Man would have the direction of his MAKER. Besides, virtue, in this case, would merit no praise : but rarely does it happen that the virtuous man does not sooner or later behold the downfall of his tyrant. Or supposing, the worst that can happen, that he falls a victim to tyranny, the boundary of all his woes is death. GOD could owe Man nothing. He called him from non-existence into life ; in with-

drawing life, He only resumes what He gave: we have nothing whereof to complain.

An entire resignation to the will of GOD ought, in every situation, to soothe the soul to peace. But if the illusions of a vain world should chance to ruffle our spirit, let me suggest a consideration which may go far toward restoring our tranquillity. When any thing in the order of Nature bears hard upon us, and inspires mistrust of it's AUTHOR, let us suppose an order of things contrary to that which galls us, and we shall find a multitude of consequences resulting from this hypothesis, that would involve much greater evils than those of which we complain. We may employ the contrary method, when some imaginary plan of human perfection would attempt to seduce us. We have but to suppose it's existence, in order to see innumerable absurd consequences springing up out of it. This twofold method, employed frequently by *Socrates*, rendered him victorious over all the sophists of his time, and may still be successfully employed to confute those of the age in which we live. It is at once a rampart which defends our feeble reason, and a battery which levels with the dust all the delusion of human opinions. If you wish to justify the order of Nature, it is sufficient to deviate from it; and, in order to refute all human systems, nothing more is necessary than to admit them.

For example, complaints are made of death: but if men were not to die, what would become of their posterity? Long before now there would not have been room for them on the face of the Earth. Death, therefore, is a benefit. Men complain of the necessity of labouring: but unless they laboured, How could they pass their time? The reputedly happy of the age, those who have nothing to do, are at a loss how to employ it. Labour, therefore, is a benefit. Men envy the beasts the instinct which guides them: but if, from their birth, they knew like them, all that they ever are to know, What should they do in the World? They would saunter through it without interest, and without curiosity. Ignorance, therefore, is a benefit.

The other ills of Nature are equally necessary. Pain of body and vexation of spirit, which so frequently cross the path of life, are barriers erected by the hand of Nature to prevent our deviating from her Laws. But for pain, bodies would be broken to pieces on the slightest shock; but for chagrin, so fre-

quently the companion of our enjoyments, the mind would become the victim of every sickly appetite. Diseases are the efforts of temperament to purge off some noxious humour. Nature employs disease not to destroy the body, but to preserve it. In every case, it is the consequence of some violation of her Laws, physical or moral. The remedy is frequently obtained by leaving her to act in her own way. The regimen of aliments restores our health of body, and that of men, tranquillity of mind. Whatever may be the opinions which disturb our repose in Society, they almost always vanish into air in Solitude. Sleep itself simply dispels our chagrin more gently, and more infallibly than a book of morals. If our distresses are immoveable, and such as break our rest, they may be mitigated by having recourse to GOD. Here is the central point toward which all the paths of human life converge. Prosperity, at all seasons, invites us to his presence, but adversity leaves us no choice. It is the means which GOD employs to force us to take refuge in Himself alone. But for this voice, which addresses itself to every one of us, we should soon forget Him, especially in the tumult of great cities, where so many fleeting interests clash with those which are eternal, and where so many second causes swallow up all attention to the FIRST.

As to the evils of Society, they are no part of the plan of Nature; but those very evils demonstrate the existence of another order of things: for is it natural to imagine, that the BEING good and just, who has disposed every thing on the Earth to promote the happiness of Man, will permit him to be deprived of it, without punishing the wretch who dared to counteract his gracious designs? Will He do nothing in behalf of the virtuous, but unfortunate man, whose constant study was to please Him, when He has loaded with blessings so many miscreants who abuse them? after having displayed a bounty which has met with no return, will He fail in executing necessary justice?

"But," we are told, "every thing dies with us. Here we ought to believe our own experience; we were nothing before our birth, and we shall be nothing after death." I adopt the analogy; but if I take my point of comparison from the moment I was nothing and when I came into existence, What becomes of this argument! Is not one positive proof better than all the negative proofs in the world? You conclude from an un-

known past to an unknown future, to perpetuate the nothingness of Man? and I, for my part, deduce my consequence from the present, which I know, to the future, which I do not know, as an assurance of this future existence. I proceed on the presumption of a goodness and a justice to come, from the instances of goodness and justice which I see actually diffused over the Universe.

Besides, if we have, in our present state, the desire and the presentiment only of a life to come ; and if no one ever returned thence to give us information concerning it, the reason is, a proof more sensible would be inconsistent with the nature of our present life on the Earth. Evidence on this point must involve the same inconveniences with that of the existence of GOD. Were we assured by some sensible demonstration, that a world to come was prepared for us, I have the fullest conviction that all the pursuits of this world would from that instant be abandoned. This perspective of a divine felicity here below, would throw us into a lethargic rapture.

I recollect that on my return to France, in a vessel which had been on a voyage to India, as soon as the sailors had perfectly distinguished the land of their native country, they became, in a great measure, incapable of attending to the business of the ship. Some looked at it wistfully without the power of minding any other object ; others dressed themselves in their best clothes, as if they had been going that moment to disembark ; some talked to themselves, and others wept. As we approached, the disorder of their minds increased. As they had been absent several years, there was no end to the admiration of the verdure of the hills, of the foliage of the trees, and even of the rocks which skirted the shore, covered over with seaweeds and mosses ; as if all these objects had been perfectly new to them. The church spires of the villages where they were born, which they distinguished at a distance up the country, and which they named one after another, filled them with transports of delight. But when the vessel entered the port, and when they saw on the quays, their friends, their fathers, their mothers, their wives, and their children, stretching out their arms to them with tears of joy, and calling them by their names, it was no longer possible to retain a single man on board ; they all sprung ashore, and it became necessary, according to

the custom of the port, to employ another set of mariners to bring the vessel to her moorings.

What then would be the case, were we indulged with a sensible discovery of that Heavenly Country, inhabited by those who are most dear to us, and who alone are most worthy of our sublime affections? All the laborious and vain solitudes of a present life would come to an end. The passage from the one world to the other being in every man's power, the gulf would be quickly shot : but Nature has involved it in obscurity, and has planted doubt and apprehension to guard the passage.

It would appear, we are told by some, that the idea of the immortality of the soul, could arise only from the speculations of men of genius, who, considering the combination of this Universe, and the connection which present scenes have with those which preceded them, must have thence concluded, that they had a necessary connection with futurity ; or else, that this idea of immortality was introduced by Legislators, in a state of polished society, as furnishing a distant hope, tending to console Mankind under the pressure of their political injustice. But if this were the case, how could it have found it's way into the deserts, and entered the head of a Negro, of a Carib, of a Patagonian, of a Tartar? How could it have been diffused, at once, over the islands of the South-Seas, and over Lapland ; over the voluptuous regions of Asia, and the rude climates of North-America ; among the inhabitants of Paris, and those of the new Hebrides? How is it possible that so many Nations, separated by vast Oceans, so different in manners and in language, should have unanimously adopted one opinion ; Nations which frequently affect, from national animosity, a deviation from the most trivial customs of their neighbours?

All believe in the immortality of the soul. Whence could they have derived a belief so flatly contradicted by their daily experience? They every day see their friends die ; but the day never comes when any one re-appears. In vain do they carry victuals to their tombs ; in vain do they suspend, with tears, on the boughs of the adjoining trees, the objects which in life were most dear to them ; neither these testimonies of an inconsolable friendship, nor the vows of conjugal affection challenged by their drooping mates, nor the lamentations of their dear children, poured out over the earth which covers their remains, can

bring them back from the land of shadows. What do they expect for themselves from a life to come, who express all this unavailing regret over the ashes of their departed favourites? There is no prospect so inimical to the interests of most men; for some, having lived a life of fraud or of violence, have reason to apprehend a state of punishment; others, having been oppressed in this world, might justly fear, that the life to come was to be regulated conformably to the same destiny which presided over that which they are going to leave.

Shall we be told, It is pride which cherishes this fond opinion in their breasts? What, is it pride that induces a wretched Negro in the West-Indies to hang himself, in the hope of returning to his own country, where a second state of slavery awaits him? Other Nations, such as the islanders of Otaheité, restrict the hope of this immortality to a renovation of precisely the same life which they are going to leave. Ah! the passions present to Man far different plans of felicity; and the miseries of his existence, and the illumination of his reason, would long ago have destroyed the life that is, had not the hope of a life to come been, in the human breast, the result of a supernatural feeling.

But wherefore is man the only one of all animals subjected to other evils than those of Nature? Wherefore should he have been abandoned to himself, disposed as he is to go astray? He is, therefore, the victim of some malignant Being.

It is the province of religion to take us up where Philosophy leaves us. The nature of the ills which we endure unfolds their origin. If man renders himself unhappy, it is because he would himself be the arbiter of his own felicity. Man is a god in exile. The reign of *Saturn*, the Golden Age, *Pandora's* box, from which issued every evil, and at the bottom of which hope alone remained; a thousand similar allegories, diffused over all Nations, attest the felicity, and the fall, of a first Man.

But there is no need to have recourse to foreign testimonies. We carry the most unquestionable evidence in ourselves. The beauties of Nature bear witness to the existence of GOD, and the miseries of Man confirm the truths of Religion. There exists not a single animal but what is lodged, clothed, fed, by the hand of Nature, without care and almost without labour. Man alone, from his birth upward, is overwhelmed with calami-

ty. First, he is born naked ; and is possessed of so little instinct, that if the mother who bare him were not to rear him for several years, he would perish of hunger, of heat, or of cold. He knows nothing but from the experience of his parents. They are under the necessity of finding him a place where to lodge, of weaving garments for him, of providing his food for eight or ten years. Whatever encomiums may have been passed on certain countries for their fertility, and the mildness of their climate, I know of no one in which subsistence of the simplest kind does not cost Man both solicitude and labour. In India, he must have a roof over his head to shelter him from the heat, from the rains, and from the insects. There too he must cultivate rice, weed it, thresh it, shell it, dress it. The banana, the most useful of all the vegetables of those countries, stands in need of being watered, and of being hedged round, to secure it from the attacks of the wild beasts by night. Magazines must likewise be provided, for the preservation of provisions during those seasons when the Earth produces nothing. When Man has thus collected around him every thing necessary to a quiet and comfortable life, ambition, jealousy, avarice, gluttony, incontinency, or languor, take possession of his heart. He perishes almost always the victim of his own passions. Undoubtedly to have sunk thus below the level of the beasts, Man must have aspired at an equality with the DEITY.

Wretched mortals ! Seek your happiness in Virtue, and you will have no ground of complaint against Nature. Despise that useless knowledge, and those unreasonable prejudices, which have corrupted the Earth, and which every age subverts in it's turn. Love those Laws which are eternal. Your destiny is not abandoned to chance, nor to mischievous demons. Recal those times, the recollection of which is still fresh among all Nations. The brute creation every where found the means of supporting life ; Man alone had neither aliment, nor clothing, nor instinct.

Divine wisdom left Man to himself, in order to bring him back to GOD. She scattered her blessings over the whole Earth, that in order to gather them, he might explore every different region of it ; that he might expand his reason by the inspection of her works, and that he might become enamoured of her from a sense of her benefits. She placed between herself and him, harmless pleasures, rapturous discoveries, pure de-

lights, and endless hopes, in order to lead him to herself, step by step, through the path of knowledge and happiness. She fenced his way on both sides, by fear, by languor, by remorse, by pain, by all the ills of life, as boundaries destined to prevent him from wandering and losing himself. The mother thus scatters fruit along the ground to induce her children to learn to walk ; she keeps at a little distance ; smiles to him, calls him, stretches out her arms towards him : but if he happens to fall, she flies to his assistance, she wipes away his tears, and comforts him.

Thus Providence interposes for the relief of Man, supplying his wants in a thousand extraordinary ways. What would have become of him in the earliest ages, had he been abandoned to his own reason, still unaided by experience ? Where found he corn, which at this day constitutes a principal part of the food of so many Nations, and which the Earth, while it spontaneously produces all sorts of plants, no where exhibits ? Who taught him agriculture, an art so simple, that the most stupid of Mankind is capable of learning it, and yet so sublime, that the most intelligent of animals never can pretend to practise it ? There is scarcely an animal but what supports it's life by vegetables, no one but what has daily experience of their re-production, and which does not employ, in quest of those that suit them, many more combinations than would have been necessary for re-sowing them.

But, on what did Man himself subsist, till an *Isis* or a *Ceres* revealed to him this blessing of the skies ? Who shewed him, in the first ages of the World, the original fruits of the orchard, scattered over the forest, and the alimentary roots concealed in the bosom of the Earth ? Must he not, a thousand times, have died of hunger, before he had collected a sufficiency to support life, or perished by poison, before he had learned to select, or sunk under fatigue or restlessness, before he had formed round his habitation grass-plots, and arbours ? This art, the image of creation, was reserved for that Being alone who bore the impression of the Divinity.

If Providence had abandoned Man to himself, on proceeding from the hands of the Creator, What would have become of him ? Could he have said to the plains : Ye unknown forests, shew me the fruits which are my inheritance ? Earth, open, and

disclose, in the roots buried under thy surface, my destined aliment? Ye plants, on which my life depends, manifest to me your qualities, and supply the instinct which Nature has denied? Could he have had recourse, in his distress, to the compassion of the beasts, and, ready to perish with hunger, have said to the cow: Take me into the number of thy children, and let me share, with thy offspring, the produce of one of thy superfluous teats? When the breath of the North-wind made him shiver with cold, would the wild goat and timid sheep have run at his call to warm him with their fleeces? Wandering, without a protector, and without an asylum, when he heard by night the howlings of ferocious animals demanding their prey, Could he have made supplication to the generous dog, and said to him: Be thou my defender, and I will make thee my slave? Who could have subjected to his authority so many animals which stood in no need of him, which surpassed him in cunning, in speed, in strength, unless the hand which, notwithstanding his fall, destined him still to empire, had humbled their heads to the obedience of his will?

How was it possible for him, with a reason less infallible than their instinct, to raise himself up to the Heavens, to measure the course of the stars, to cross the Ocean, to call down the thunder, to imitate most of the Works and appearances of Nature? We are struck with astonishment at these things now; but I am much rather astonished, that a sense of Deity should have spoken to his heart, long before the comprehension of the Works of Nature had perfected his understanding. View him in the state of nature, engaged in perpetual war with the elements, with beasts of prey, with his fellow-creatures, with himself; frequently reduced to situations of subjection which no other animal could possibly support; and he is the only being who discovers, in the very depth of misery, the character of infinity, and the restlessness of immortality. He erects trophies; he engraves the record of his achievements on the bark of trees; he celebrates his funeral obsequies, and puts reverence on the ashes of his forefathers, from whom he has received an inheritance so fatal.

He is incessantly agitated by the rage of love or of vengeance. When he is not the victim of his fellow men, he is their tyrant: and he alone knows that Justice and Goodness govern the

World, and that Virtue exalts Man to Heaven. He receives from his cradle none of the presents of Nature, no soft fleecce, no plumage, no defensive armour, no tool, for a life so painful and so laborious; and he is the only being who invites the Gods to his birth, to his nuptials, and to his funeral obsequies.

However far he may have been misled by extravagant opinions, as often as he is struck by unexpected bursts of joy or of grief, his soul, by an involuntary movement, takes refuge in the bosom of Deity. He cries out: Ah, my GOD! He raises to Heaven suppliant hands, and eyes bathed with tears, in hope of there finding a Father. Ah! the wants of Man bear witness to the Providence of a Supreme Being. He has made man feeble and ignorant, only that he may stay himself in his strength, and illuminate himself by his light; and so far is it from being true, that chance, or malignant spirits, domineer over a World, where every thing concurred to destroy a creature so wretched, his preservation, his enjoyments, and his empire, demonstrate, that at all times a benificent GOD has been the friend and the protector of human life.

STUDY IX.

OBJECTIONS AGAINST THE METHODS OF OUR REASON, AND THE PRINCIPLES OF OUR SCIENCES.

I HAVE displayed from the beginning of this Work, the immensity of the Study of Nature. I there proposed new plans, to assist us in forming an idea of the order which she has established in all her various kingdoms: but, checked by my own incapacity, all that I could presume to promise was, to trace a slight sketch of what exists in the vegetable order. However, before I proceed to lay down new principles on this subject, I thought myself called upon to refute the prejudices which the World, and our Sciences themselves, might have diffused over Nature, in the minds of my Readers. I have accordingly exhibited a faint representation of the goodness of Providence to the age in which we live, and the objections which have been raised against it. I have replied to those objections, in the same order in which I have stated them, pointing out as I went along, the wonderful harmony which prevails in the distribution of the Globe, abandoned, as some would have it, to the simple Laws of motion and of chance.

I have presented a new theory of the courses of the Tides, of the Motion of the Earth in the Ecliptic, and of the Universal Deluge: and I am now going to attack, in my turn, the methods of our Reason, and the Elements of our Sciences, before I proceed to lay down some principles, which may indicate to us a certain path to the discovery of Truth.

But let it be understood, that if, in the course of this Work, and particularly in this article, I have combatted our natural Sciences, it is only so far as system is concerned; I give them full credit on the side of observation. Besides, I highly respect the persons who devote themselves to the pursuit of Science. I know nothing in the world more estimable, next to the virtuous man, than the man of real knowledge, if however it be possible to separate the Sciences from Virtue. What sacrifices and privations does not the cultivation of them demand! While the herd of Mankind is growing rich and renowned by agriculture,

commerce, navigation, and the arts, it has been frequently seen that those who cleared the way for all the rest, lived in indigence themselves, unknown to, and disregarded by, their contemporaries. The man of Science, like the torch, illuminates all around him, and remains himself in obscurity.

I have attacked, then, neither the Learned, whom I honour, nor the Sciences, which have been my consolation through life: but had time permitted, I would have disputed every inch of ground with our methods and our systems. They have thrown us into such a variety of absurd opinions, in every branch of scientific research, that I do not hesitate to affirm, our libraries, at this day, contain more of error than of information. Nay, I could venture to wager, that were you to introduce a blind man* into the King's Library, and let him take out any book at a venture, the first page of that book on which he may chance to lay his hand shall contain an error. How many probabilities should I have in my favour, among romance-writers, poets, mythologists, historians, panegyrists, moralists, naturalists of ages past, and metaphysicians of all ages and of all countries? There is, in truth, a very simple method to check the mischief which their opinions might produce; it is to arrange all the books which contradict themselves, by the side of each other; as these are, in every walk of literature, almost infinite in number, the result of human knowledge, as far as they convey it, will be reduced almost to nothing.

By our very methods of acquiring knowledge, we are deluded into error. First, to succeed in the search of Truth, we ought to be entirely exempted from the influence of passion; and yet,

* The word in the original is, a *Quinze-vingt*. The *Quinze-vingt* at Paris is a royal foundation of Saint *Louis*, for the relief of *fifteen score*, that is, three hundred blind persons: hence, in the Parisian phrase, any one, in general, afflicted with the want of sight, is denominated a *Quinze-vingt*.

The *King's-Library* is another establishment, which reflects the highest honour on the French Government. It was founded by the famous Cardinal *de Richlieu*; who, however, transferred the credit of it to the Prince. The building is erected in the very centre of the Metropolis, and contains a most magnificent collection of books and manuscripts, in all languages, and relative to every art and science; of drawings, models, mathematical instruments, &c. It is opened on certain days of the week, and for a considerable part of the day, for the inspection and use of strangers as well as natives. And even in Paris, I saw no petty officer, on duty at the Library, hold out his hand for a fee.—H. II.

from our earliest infancy, the passions are wilfully set afloat, and thus reason receives an improper bias from the very beginning. This maxim is laid down as the fundamental basis of all conduct, and of all opinions, *Make your fortune*. The effect of this is, we no longer prize any thing but what has some relation to this appetite. Even natural truths vanish out of sight, because we no longer contemplate Nature, except in machines or books.

In order to our believing in GOD, some person of consequence must assure us there is one. If *Fenelon* says it is so, we admit it, because *Fenelon* was preceptor to the Duke of *Burgundy*, an Archbishop, a man of quality, and addressed by the title of My Lord. We are fully convinced of the existence of GOD by the arguments of *Fenelon*, because his credit reflects some upon ourselves. I do not mean to affirm, however, that his virtue contributed nothing to the force of his reasoning: but no farther than as it stands in connection with his reputation and his fortune; for were we to meet this same virtue in a water porter, it's lustre would fade in our eyes. To no purpose would such a one furnish proofs of the existence of a GOD, more unanswerable than all the speculations of Philosophy, in a life labouring under contempt, hard, poor, laborious, exhibiting uniform probity and fortitude, and passed in perfect resignation to the will of the Supreme: these testimonies so positive are of no consideration at all with us; we estimate their importance from the celebrity which they have acquired. Let some Emperor be disposed to adopt the Philosophy of this obscure man, his maxims will be immediately extolled in every book that is published, and quoted in every academical thesis; engraved portraits of the Author, would decorate every pannel, and his bust in plaster of Paris grace every chimney; he should be an *Epictetus*, a *Socrates*, a *John James Rousseau*.

But should a period come, in which arose men of as high reputation as these, in favour with powerful Princes, whose interest it might be, that there should be no GOD, and who, in order to make their court to such Princes, denied his existence; from the same effect of our education, which engaged us to believe in GOD, on the faith of *Fenelon*, *Epictetus*, *Socrates* and *John James Rousseau*, we would renounce our belief, on the credit of the others, being men of such high consideration, and, besides, so much nearer to us. It is thus our education warps us:

it disposes us indifferently to preach the Gospel or the Alcoran, according as our interest is concerned in the one or in the other.

Hence arose this maxim so universal and so pernicious : *primo vivere, deinde philosophari*—"to live first, and seek wisdom afterward." The man who is not ready to give his life in exchange for wisdom, is unworthy of knowing her. *Juvenal's* sentiment is much more rational, and deserves rather to be adopted :

Summum crede, nefas vitam præferre pudori;
Et propter vitam, vivendi prædere causas.

Imitated thus :

The worst of crimes, believe it, generous youth,
Is to buy life, by selling sacred truth :
Virtue's the gem of life, the Sage's store ;
But life is death, when honour is no more.

"The blackest of crimes, believe it, is to prefer life to honor ; and for the sake of a few paltry years of mere existence, to sacrifice that which alone makes life desirable."

I say nothing of other prejudices which oppose themselves to the investigation of truth, such as those of ambition, which stimulate every one among us to distinguish himself ; and this can hardly be done except in two ways ; either by subverting maxims the most undoubted, and the most firmly established, in order to substitute our own in their place ; or by making an effort to please all parties, from uniting opinions the most contradictory ; and this, taking the two cases together, multiplies the ramifications of error to infinity. Truth has, farther, to encounter a multitude of other obstacles on the part of powerful men, who can make an advantage of error. I shall confine myself to those which are to be imputed to the weakness of our reason, and shall examine their influence on our acquirements in natural knowledge.

It is easy to perceive, that most of the Laws which we have presumed to assign to Nature, have been deduced sometimes from our weakness, sometimes from our pride. I shall take a few instances, as they happen to occur to my thoughts, and which are considered as most indubitably certain. For example, we have settled it, that the Sun must be in the centre of the planets, in order to regulate their motion, because we are (in-

der the necessity of placing ourselves in the centre of our personal concerns, for the purpose of keeping an eye over them. But if, in the case of the celestial spheres, the centre naturally belongs to the most considerable bodies how comes it about that *Saturn* and *Jupiter*, which greatly exceed our Globe in magnitude, should be at the extremity of our vortex?

As the shortest road is that which fatigues us least, we have taken upon us to conclude, that, in like manner, this must be the plan of Nature. Consequently, in order to spare the Sun a journey of about ninety millions of leagues, which he must every day perform, in giving us light, we set the Earth spinning round it's own axis. It may be so; but if the Earth revolves round itself, there must be a great difference in the space passed through by two cannon balls, shot off at the same instant, the one toward the East, and the other toward the West; for the first goes along with the motion of the Earth, and the second goes in the opposite direction. While both are flying in the air, and removing the one from the other, each proceeding at the rate of six thousand fathoms in a minute, the Earth, during that same minute, is outflying the first, and removing from the second, with a velocity which carries it along at the rate of sixteen thousand fathoms; this ought to put the point of departure twenty two thousand fathom behind the ball which is flying to the West, and ten thousand fathom before that which is flying to the East.

I once proposed this difficulty to a very able Astronomer, who considered it as almost an insult. He replied, as the custom of our Doctors is, that the objection had been made long before and refuted. At length, as I entreated him to have compassion on my ignorance, and to give me the solution, he retailed to me the pretended experiment, of a ball dropped from the top of a ship's mast when under sail, and which falls on deck close to the mast, notwithstanding the ship's progressive motion. "The Earth," said he, "carries along, in like manner, the rotation of the two balls, in it's own movement. Were they to be shot off in a perpendicular direction, they would fall back precisely on the point from whence they were emitted." As axioms are not very expensive, and serve to cut short all difficulties, he subjoined this as one: "The motion of a great body absorbs that of a small." If this axiom be founded in truth,

replied I, the ball dropped from the top of the mast of a ship under sail, ought not to fall back close to the bottom of the mast ; it's motion ought to be absorbed, not by that of the vessel, but by that of the Earth, which is by far the greater body. It ought to obey only the direction of gravity ; and for the same reason the Earth ought to absorb the motion of the bullet which is going along with it toward the East, and force it back into the cannon from which it issued.

I was unwilling to push this difficulty any farther ; but I remained, as has frequently happened to me after the most luminous solutions of our schools, still more *perplexed* than I was before. I began to call in question the truth of not only a system and of an experiment, but what is worse, of an axiom. Not that I reject our planetary system, such as it is given us ; but I admit it for the same reason which at first suggested it. It is from it's being the best adapted to the weakness of my body, and of my mind. I find, in fact, that the rotation of the Earth, every day, saves the Sun a prodigious journey : but, in other respects, I by no means believe that this system is that of Nature, and that she has disclosed the causes of motion to men who are incapable of accounting for the movement of their own fingers.

I beg leave to suggest some farther probabilities in favour of the Sun's motion round the Earth. " The Astronomers of Greenwich, having discovered that a star of Taurus has a declination of two minutes every twenty-four hours ; that this star not being dim, and having no train, cannot be considered as a comet, communicated their observations to the Astronomers of Paris, who found them accurate. M. *Messier* was appointed to make a report of this to the Academy of Sciences, at their next meeting."*

If the Stars are Suns, here then is a Sun in motion, and that motion is a presumption, at least, that ours may move.

The stability of the Earth may be presumed, on the other hand, from this circumstance, that the distance of the Stars never changes with respect to us, which must perceptibly take place, if we performed every year, as is alleged, a round of sixty-four millions of leagues in diameter through the Heavens ;

* Extract from the *Courier de l'Europe*, Friday, 4th May, 1781

for in a space so vast, we must of necessity draw nigher to some and remove from others.

Sixty-four millions of leagues, we are told, dwindle to a point in the Heavens, compared to the distance of the Stars. I am much in doubt as to the truth of this. The Sun, which is a million of times greater than the Earth, presents an apparent diameter of only six inches, at the distance of thirty-two millions of leagues from us. If this distance reduces to a diameter so small, a body so immense, it is impossible to doubt, that double the distance, namely sixty-four millions of leagues, would diminish it still much more, and reduce it perhaps to the apparent magnitude of a Star ; and it is far from being impossible, that on being thus diminished, and on our still removing sixty-four millions of leagues farther, he would entirely disappear. How comes it to pass, then, that when the Earth approaches, or removes to this distance from the Stars in the Firmament, in performing it's annual circle, no one of those Stars increases or diminishes in magnitude with respect to us.

I submit some farther observations, tending to prove that the Stars have, at least, motions peculiar to themselves. The ancient Astronomers have observed in the neck of the Whale, a Star which presented much variety in it's appearances ; sometimes it appeared for three months together, sometimes during a long interval ; sometimes it's apparent magnitude was greater, sometimes smaller. The time of it's appearance was irregular. The same Astronomers report, that they had observed a new Star in the heart of the Swan, which from time to time disappeared. In the year 1600 it was equal to a Star of the first magnitude ; it gradually diminished, and at length disappeared. *M. Cassini* perceived it in 1655. It increased for five years successively ; it then began to decrease, and re-appeared no more. In 1760 a new Star was observed near the head of the Swan. Father *Anselm*, a Carthusian friar, and several other Astronomers, made the observation. It disappeared, and became again visible in 1672. From that period it was seen no more till 1709, and in 1713 is totally disappeared.

These examples demonstrate that the Stars not only have motions, but that they describe curves very different from the circles and the ellipses which we have assigned to the heavenly bodies. I am fully persuaded, that there is among these the

same variety of motion, as between those of many terrestrial bodies; and that there are stars which describe cycloids, spirals, and many other curves of which we have not so much as an idea.

I must proceed no farther on this ground, for fear of appearing better informed respecting the affairs of Heaven, than those which are much nearer us. All that I intended was to expose my doubts and my ignorance. If Stars are Suns, then there must be Stars in motion; and, surely, ours may be in motion as well as they are.*

It is thus that our general maxims become the sources of error; for we never fail to charge with disorder whatever seems to recede from our pretended order. That which I formerly quoted, namely, that Nature, in her operations, takes always the shortest road, has filled our Physics with false views innumerable. There is nothing however more flatly contradicted by experience. Nature makes the waters of the rivers to meander through the Land, in their progress to the Sea, instead of transmitting them in a straight line. She causes the veins to perform a winding course through the human body; nay, she has perforated certain bones expressly, in order to afford a passage to some of the principal veins into the interior of the stronger limbs, to prevent their being exposed to injury by external concussions. In a word, she expands a mushroom in one night, but takes a century to bring an oak to perfection. Nature very seldom takes the nearest road, but she always takes that which is best adapted to her purpose.

* I now leave the Reader to reflect on the total disappearance of those Stars. The Ancients had observed seven Stars in the Pleiades. Six only are now perceptible. The seventh disappeared at the siege of Troy. *Ovid* says, it was so affected by the fate of that unfortunate city, as from grief to cover it's face with it's hand. I find in the book of *Job* a curious passage, which seems to presage this disappearance: it is chap. xxxviii. ver. 31. *Nunquid conjungere valebis micantes stellas pleiades, aut gyrum arcturi poteris dissipare?* "Will it be in thy power to unite the brilliant Stars, the Pleiades; and to turn aside the Great Bear from it's course?" This is the import of the translation of M. le Maître de Sacy. However, if I might venture to give an opinion after that learned man, I would put a different sense on the conclusion of the passage. *Gyrum arcturi dissipare*, means, in my opinion, "to dissipate the attraction of the arctic pole." I here repeat what I have already observed, that the Book of *Job* is replenished with most profound knowledge of Nature.

This rage for generalizing has dictated to us, in every branch of Science, an infinite number of maxims, sentences, adages, which are incessantly contradicting themselves. It is one of our maxims, that a man of genius catches every thing at a glance, and executes all by one single Law. For my own part, I consider this sublime method of observing and executing, as one of the strongest proofs of the weakness of the human mind. Man never can proceed with confidence but in one single path. As soon as a variety present themselves, he becomes perplexed, and goes astray; he is at a loss to ascertain which he ought to pursue: that he may make sure of not deviating, he admits only one to be right; and once engaged, right or wrong, pride stimulates him forward. The AUTHOR of Nature, on the contrary, embracing in his infinite intelligence all the spheres of all beings, proceeds to their production by Laws as various as his own inexhaustible conceptions, in order to the attainment of one single end, which is their general good. Whatever contempt Philosophers may express for final causes, they are the only causes which he permits us to know. All the rest He is pleased to conceal from us; and it is well worthy of being remarked, that the only end which He discloses to our understanding is also the same with that which he proposes to our virtue.

One of our most ordinary methods, when we catch some effect in Nature, is to dwell upon it, at first, from weakness, and afterwards, to deduce from it an universal principle, out of vanity. If after this we can find means, and it is no difficult matter to apply to it a geometrical theorem, a triangle, an equation, were it but an $a+b$, this is sufficient to render it for ever venerable. It was thus that, in the last age, every thing was explained on the principles of the corpuscular philosophy, because it was perceived that some bodies were formed by intus-susception, or an aggregation of parts. A seasoning of Algebra, which they found means to add to it, has invested it with so much the more dignity, that most of the reasoners of those times understood nothing of the matter. But being indifferently endowed, it's reign was of short duration. At this day, we do not so much as mention the names of a long list of learned and illustrious gentlemen, whom all Europe then concurred in covering with laurels.

Others having found out that air pressed, set to work with every species of machinery to demonstrate that air possessed gravity. Our books referred every thing to the gravity of the air; vegetation, the human temperament, digestion, the circulation of the blood, the phenomena, the ascension, of fluids. They found themselves somewhat embarrassed, it is true, by capillary tubes, in which the fluid ascends, independently of the action of the air. But a solution was found for this likewise; and *woe betide* those, in the phrase of certain Writers, who do not comprehend it! Others applied themselves to the investigation of it's elasticity, and have explained equally well all the operations of Nature by this quality of the air. The universal ery was, now the veil is removed; we have caught her in the fact. But did not the Savage know, when he walked against the wind, that air had both gravity and elasticity? Did he not employ both those qualities in managing his canoe when under sail? I do not object to investigation, if natural effects are applied, after exact calculation and unequivocal experiment, to the necessities of human life; but they are for the most part introduced for the purpose of regulating the operations of Nature, and not our own.

Others find it still more commodious to explain the system of the Universe, without deducing any consequence from it. They ascribe to it laws which have so much accuracy and precision, that they leave to the Divine Providence nothing more to do. They represent the Supreme Being as a Geometrician, or a Mechanist, who amuses himself with making spheres, merely for the pleasure of setting them a-spinning round. They pay no regard to harmonies and other moral causes. Though the exactness of their observations may do them honour, the results are by no means satisfactory. Their manner of reasoning on Nature resembles that of a Savage, who on observing in one of our cities the motion of the indexes of a public clock, and seeing that on their pointing in a certain direction upon the hour-plate, the turrets fell a shaking, crowds issued into the streets, and a considerable part of the inhabitants were put in motion, should thence conclude that a clock was the principle of all European occupations. This is the defect to be imputed to most of the Sciences, which without consulting the end of the operations of Nature, perplex themselves in an un-

profitable investigation of the means. The Astronomer considers only the course of the Stars, without paying the slightest attention to the relations which they have with the seasons. Chemistry, having discovered in the aggregation of bodies only saline particles which mutually assimilate, sees nothing but salt as the principle and the object. Algebra having been invented in order to facilitate calculation, has degenerated into a Science which calculates only imaginary magnitudes, and which proposes to itself theorems only, totally inapplicable to the demands of human life.

From all this results an infinity of disorders, far beyond what I am able to express. The view of Nature, which suggests to Nations the most savage, not only the idea of a GOD, but that of an infinity of Gods, presents to the Philosophers of the day only the idea of furnaces, of spheres, of stills, and of crystallizations.

The Naiads, the Sylvans, Apollo, Neptune, Jupiter, impressed upon the Ancients some respect at least for the Works of Creation, and attached them still farther to their Country by a sentiment of religion. But our machinery destroys the harmonies of Nature and of Society. The first is to us nothing but a gloomy theatre, composed of levers, pulleys, weights, and springs; and the second merely a school for disputation. Those systems we are told give exercise to the mental faculties. It may be so; but may they not likewise mislead the understanding? And the heart is in no less danger of being depraved. While the head is laying down principles, the heart is frequently deducing consequences. If every thing is the production of unintelligent powers, of attractions, of fermentations, the play of fibres, of masses, we then are subjected to their laws, as all other bodies are. Women and children deduce these consequences. What in the mean time becomes of Virtue? You must submit, say these ingenious gentlemen, to the Laws of Nature. So then we must obey the power of gravity; sit down and walk no more. Nature speaks to us by a hundred thousand voices. Which of these is now sounding in our ears? What, will you adopt as the rule of your life the example of fishes, of quadrupeds, of plants, or even of the heavenly bodies?

There are Metaphysicians, on the contrary, who without paying regard to any one Law of Physics, explain to you the whole

system of the Universe by means of abstract ideas. But this is a proof that their system is not the system of Nature, namely, that with their materials and their method, it would be an easy matter to subvert their order, and to frame another totally different from it, provided one were disposed to take the small trouble which it requires. Nay a reflection arises out of this, which levels a mortal blow at the pride of human understanding ; it is this, that all these efforts of the genius of Man, so far from being able to construct a World, are incapable of so much as putting a grain of sand in motion.

There are others who consider the state in which we live as a state of progressive ruin and of punishment. They proceed on the supposition, conformably to the authority of the Sacred Writings, that this Earth once existed with other harmonies. I readily admit what Scripture says on this subject, but I object to the explanations of Commentators. Such is the weakness of our intellectual powers, that we are incapable of conceiving or imagining any thing beyond what Nature actually exhibits to us. They are grossly mistaken accordingly when they affirm, for instance, that when the Earth was in a state of perfection, the Sun was constantly in the Equator ; that the days and nights were perpetually equal ; that there was an eternal Spring ; that the whole face of the ground was smooth and level, and so on.

Were the Sun constantly in the Equator, I question whether a single spot of the Globe would be habitable. First, the Torrid Zone would be burnt up by his fervent heat, as has been already demonstrated ; the two Icy Zones would extend much farther than they do at present ; the Temperate Zones would be at least as cold toward their middle as they are with us at their vernal Equinox ; and this temperature would prevent the greatest part of fruits from coming to maturity. I know not where the perpetual Spring would be ; but if it could any where exist, never could Autumn there exist likewise. The case would be still worse were there neither rocks nor mountains on the surface of the Globe, for not one river, nay not a brook of water would flow over the whole Earth. There would be neither shelter nor reflex to the North, to cherish the germination of plants, and there would be neither shade nor moisture to the South, to preserve them from the heat. These wonderful arrangements actually exist in Finland, in Sweden, at Spitzberghen, and over

the whole northern regions, which become loaded with rocks in proportion as the latitude increases : and they rise in like manner in the Antilles, in the Isle of France, and in all the other islands and districts comprehended between the Tropics, where the face of the ground is covered over with rocks, especially toward the Line ; in Ethiopia, the territory of which Nature has overspread with vast and lofty rocks, almost perpendicular, which form all around them deep valleys, delightfully shaded and cool. Thus, as was before observed, in order to refute our pretended plans of perfection, it is sufficient to admit them.

There is another class of Literati, on the contrary, who never deviate from their track, and who abstain from looking at any thing beyond it, however rich in facts they may be : such are the botanists. They have observed the sexual parts in plants, and employ themselves entirely in collecting and arranging them, conformably to the number of those parts, without troubling themselves about knowing any thing farther of them. When they have classed them in their heads and in their herbals, into umbellated, into rose-formed, or into tubulous, with the number of their stamina ; if to this they are able to affix a parcel of Greek terms, they are possessed, as they imagine, of the complete system of vegetation.

Others of them, to do them justice, go somewhat farther. They study the principles of plants ; and in order to attain their object, pound them in mortars, or dissolve them in their alembics. The process being completed, they exhibit salts, oils, earths ; and tell you gravely these are the principles of such and such a plant. For my own part, I no more believe that any one can shew me the principles of a plant in a phial, than he can display those of a wolf, or of a sheep in a kettle.* I respect the mysterious operations of Chemistry ; but whenever they act on vegetables, the process destroys them. Permit me to quote

* There is much force and good sense in this observation. The chemical analysis is still in an infant state, though it must be confessed that it has been brought to a high degree of perfection, compared to what it was in the time of Chomel. What stronger proofs of the imperfections of the analysis, than that Fontana found that the venom of the viper and the salutary gum-arabic afforded him on distillation the *same* results ? The analysis of digitalis, or fox-glove, does not afford any principles, or products, which are not afforded by many of the simple bitter plants, to which nothing deleterious is attached. B. S. B

the decision which an eminent Physician has pronounced on his own experiments. I mean Dr. *J. B. Chomel*, in the preliminary discourse to his useful Abridgement of the History of Common Plants.* “Two thousand analysis nearly,” says he, “of different plants, made by the Chemists of the Royal Academy of Sciences, have afforded us no farther information than this, that from all vegetables may be extracted a certain quantity of an acid liquor, more or less of essential or fetid oil, of salt fixed, volatile, or concrete, of insipid phlegm, and of earth; and in many cases almost the same principles, and in the same quantities, from plants whose virtues are extremely different. This very tedious and very painful pursuit, accordingly, has turned out a merely useless attempt toward a discovery of the effects of plants; and has served only to undeceive us respecting the prejudices which might have been entertained in favour of such an analysis.” He adds, that the celebrated Chemist *Homberg*, having sown the seeds of the same plants in two frames filled with earth, impregnated with a strong lye, the one of which was afterwards watered with common water, and the other with water in which nitre had been dissolved, these plants re-produced very nearly the same principles. Here then is our systematic Science completely overturned; for it can discover the essential qualities of plants, neither by their composition nor their decomposition.

Many other errors have been adopted respecting the Laws of the expansion and the fecundation of plants. The ancients had distinguished in many plants males and females; and a fecundation, by means of emanations of the seminal powder, such as in the date-bearing palm-tree. We have applied this Law to the whole vegetable kingdom. It embraces no doubt a very extensive field; but how many vegetables besides propagate themselves by suckers, by slips, by knittings, by the extremities of their branches! Here are then, in the same kingdom, various methods of re-production. Nevertheless, when we perceive no longer in Nature the Law which has once been adopted in our books of Science, we are weak enough to imagine that she has gone astray. We have only one thread, and when it snaps we conclude that the system of the Universe must be on the point

* Vol. i. p. 37

of dissolution. The Supreme Intelligence disappears from before our eyes the moment that our own happens to be a little disturbed. I entertain no doubt however, that the AUTHOR of Nature has established laws for the vegetable World, now so generally studied, which are still to us entirely unknown. I take the liberty to subjoin on this subject an observation which I submit to the experience of my Readers.*

Having transplanted, in the month of February of the year 1783, some simple violet plants, which had begun to push out small flower buds; this transplantation checked their expansion in a manner very extraordinary. These small buds never came into flower, but their ovary having swelled, attained the usual size, and changed into a capsula filled with seeds, without displaying, outwardly or inwardly, either petal, or anthera, or stigma, or any part whatever of the flower. All these buds presented successively the same phenomena in the months of May, of June, and of July, but no one of those violet plants presented the least semblance of a flower. I only perceived in the shooting buds which I opened, the parts which should have composed the flower withered within the calix. I sowed again their seeds which had not been fecundated, and hitherto they have not sprung up. This experiment so far is favourable to the Linnaean system; but it is in another respect a deviation, as it demonstrates the possibility of a plant's producing fruit without having flowered.

It may be here proper to remark, once for all, that physical Laws are subordinate to the Laws of utility, that is, to give an instance, the Laws of vegetation are adapted to the preservation

* It is not, I think, correctly observed, that "the ancients had distinguished in *many* plants, males and females." They had only, so far at least as we are permitted to perceive from those writings of their philosophers, that have reached us, imperfectly or obscurely distinguished the sexes in a *very few* plants. It was reserved for the moderns to show by numerous experiments, that the sexual organs do exist in vegetables; and to render it probable that in the *greater number* of those, fecundation is accomplished by an intercourse between these organs. I say the greater number, for really, I do not think that the law is so *universal* as many naturalists imagine. Plants do unquestionably perpetuate themselves independently of sexual organs: and I am of opinion that even in regard to that numerous set of vegetables which are furnished with flowers, the *germ* of the female blossom is sometimes not merely enlarged, but enlarged by the growth of fertile seed, which perpetuate their like, though *it* have never received the influence of any male flower whatever.—B. S. B.

of sensible beings, for whose use they were designed. Accordingly, though the flowering of my violet may have been interrupted, this prevented not the production of it's seeds, which were destined to be the subsistence of some animal, whose natural food it is. For this reason too the most useful plants, such as the gramineous, are those which have the greatest variety of methods to re-produce themselves. If Nature, with respect to them, had confined herself rigidly to the law of florification, they could not multiply, when pastured upon by animals which continually browse on their summits. The same thing takes place with regard to such as grow along the water courses, as reeds and the aquatic trees; willows, alders, osiers, mangliers, when the waters swell, and bury them in sand, or totally subvert them, as is frequently the case. The shores would remain destitute of verdure, if the vegetables which are native there had not the faculty of re-production by means of their own shoots. But the case is different with respect to the vegetable inhabitants of the mountains, as palm-trees, firs, cedars, larches, pines, which are not exposed to similar accidents, and which cannot be propagated by slips. Nay, if you crop off the summit of the palm-tree, it dies.

We likewise find these same laws of adaptation and utility in the generation of animals, to which we ascribe uncertainty, as soon as we perceive variety; or when we apprehend an approximation to the vegetable kingdom by means of imaginary relations, suggested by the perception of effects common to both. Thus, for example, if some of our more delicate plant-insects are viviparous in Summer, it is because their young find at that season the temperature and the food which are adapted to them on coming into the world; and if they are oviparous in Autumn, it is because the posterity of creatures so delicate could not have survived the Winter, without having been shut up in eggs. For similar reasons, if you tear off a claw from a live crab or lobster, it pushes out another, which springs out of it's body, as a branch out of a tree. Not that this animal's re-production is the effect of any mechanical analogy between the two kingdoms: but those animals being destined to live on the shores, among the rocks, where they are exposed to the agitation of the waves, Nature has bestowed on them the faculty of re-producing the limbs exposed to be bruised, or broken off, by

the rolling about of rocky substances, as she has given to vegetables which grow by the waters the power of re-production by shoots, because they are exposed to the danger of being overwhelmed by inundations.

Medicine has deduced a multitude of errors from those apparent analogies of the vegetable and animal kingdoms. It is sufficient to examine the train of her studies, to be satisfied that they are liable to strong suspicions. She pursues the operations of the soul through the structure of a corpse, and the functions of life in the lethargy of death. If she happens to perceive some valuable property in a vegetable, she exalts it into an universal remedy. Listen to her aphorisms. Plants are useful to human life: hence she concludes, that a vegetable diet will make a man live for several ages. Who is able to enumerate the books, the treatises, the panegyrics, which have been composed on the virtues of plants! Multitudes of patients die, notwithstanding, with their stomachs full of those wonderful simples. Not that I undervalue their qualities when judiciously applied; but I absolutely reject the reasonings which attempt to connect the duration of human life with the use of a vegetable regimen.*

The life of Man is the result of all the moral adaptations, and depends much more on sobriety, on temperance, and the other virtues, than on the nature of aliments. The animals which live entirely on plants, do they even attain so much as the age of Man? The deer and wild goats, which feed on the admirable vulnerary herbs of Switzerland ought never to die; nevertheless they are very short lived. The bees which suck the nectar of their flowers likewise die, and several of their species, in the space of one year. There is a limited term fixed for the life of every kind of animal, and a regimen peculiar to it; that of Man

* In my opinion, the analogies between animals and vegetables are numerous, insomuch that it is difficult, if not impossible, to say where lies the line of distinction between these two great empires, or assemblages of living, organized bodies. The study of these analogies is one of the richest and most beautiful subjects in the whole range of the inquiries of the naturalist: it is, indeed, a science of itself; for it involves a knowledge of all the properties, and functions, and habits, of animals and vegetables. I cannot perceive in what manner, or in what instances, "medicine has deduced a multitude of errors from those (apparent) analogies." But I readily agree with Saint-Pierre, that there is no necessary connection between "the duration of human life with the use of a vegetable regimen."—B. S. B.

alone extends to every variety of aliment. The Tartar lives on raw horse-flesh, the Dutchman on fish, another nation on roots, another on milk diet; and in all countries you meet with old people. Vice alone, and mental uneasiness, shorten human life; and I am persuaded, that the moral affections are of such extensive influence, with respect to Man, that there is not one in the whole catalogue of diseases but what owes it's origin to them.*

Hear what *Socrates* thought of the systematic Philosophy of his age; for in all ages she has abandoned herself to the same extravagancies. "He did not amuse himself," says *Xenophon*,† "with researches into the mysteries of Nature; or with enquiring in what manner that which the Sophists call the World was created; nor what irresistible elastic force governs all celestial things: on the contrary, he exposed the folly of those who addict themselves to such contemplations, and demanded, if it was after having acquired a perfect knowledge of human things, that they undertook the investigation of those which are divine; or whether they considered it as a character of true wisdom, to neglect what was within their reach, in order to grasp at objects far above them. He expressed still farther astonishment, that they did not discern the impossibility of Man's comprehending all those wonders, considering that the persons who had the reputation of being most profoundly skilled in such matters, maintained opinions

* The *Cervina Senectus*, the old age of the deer, may be a fable: but I believe it is a fact, that some species of deer are by no means short-lived. However, it is a fact, that not a few of the herbivorous animals are much longer-lived than man. I mention only the elephant, among the mammalia, and some species of parrot, among the birds. I cannot agree with our author, that it is the privilege of man alone to feed on a great variety of aliment. The diet of many other animals is not much less various than that of man. Look at the hog, the duck, not to mention many others. In our view of this subject, we should pause to recollect, that our opportunities of observing the native food of animals, in their wild state, are not numerous. But having myself paid great attention to this subject for many years, I have found that many of our carnivorous animals, as we call them, consume a portion of vegetable food: and, on the other hand, that all our reputed herbivorous animals, whether quadrupeds or birds, devour animal matters. Thus the white bear greedily devours the berries of some species of *vaccinium*; and the deer, the common black-cattle, &c., eat fish. Even the humming bird lives, in part, upon insects.—B. S. B.

† *Xenophon's* Memorable Things of *Socrates*, book i

“ contradictory to each other, and quarrelled like madmen. For
“ as among madmen there are some undaunted at the approach
“ of the most formidable calamities, and others affrighted where
“ there is no appearance of danger ; in like manner, among those
“ Philosophers some have maintained, that there is no action
“ which may not be performed in public, nor a word which may
“ not be freely spoken in the presence of the whole World ;
“ others on the contrary have taught, that all intercourse with
“ men ought to be broken off, and perpetual solitude preferred
“ to society : some have poured contempt on temples and altars,
“ and derided the worship of the Gods ; others are such slaves
“ to superstition, as to adore wood, and stone, and irrational
“ animals. And as to the Science of natural things, some have
“ acknowledged but one single being ; others have admitted an
“ infinite number : some insist, that all things are in a state of
“ perpetual motion ; others, that there is no such thing as mo-
“ tion : some tell you that the world is filled with incessant ge-
“ nerations and dissolutions ; and others assure you that nothing
“ is generated or destroyed. He said farther, that he would
“ gladly be informed by those ingenious gentlemen, whether
“ they entertained the hope of some time or other reducing to
“ practice what they taught, as persons instructed in any art
“ have it in their power to exercise it at pleasure, either for
“ their own private emolument, or for the benefit of their friends ;
“ and whether they likewise imagined, after they had discover-
“ ed the causes of every thing that comes to pass, that they
“ should be able to dispense winds and rains, and dispose of
“ times and seasons, in subserviency to their necessities ; or if
“ they satisfied themselves with the bare knowledge of those
“ things, without any expectation of advantage from them.”

Not that *Socrates* was unacquainted with Nature, for he had studied her thoroughly ; but he had relinquished the investigation of the causes, entirely in the view of rising into admiration at the results. No one had ever collected more observations on this subject than he had done. He made frequent use of these in his conversations on the Divine Providence.

Nature presents to us, on every side, nothing but harmonies and adaptations to our necessities ; and we will obstinately persist in vain efforts to trace her up to the causes which she employs ; as if we meant to extort from her the secrets of her

power. We do not so much as know the most common principles which she sets a working in our hands and in our feet. Earth, water, air, and fire, are elements, as we say. But under what form must Earth appear in order to be an element? That stratum called *humus*, which almost every where covers it and which serves as a basis to the vegetable kingdom, is a refuse of all sorts of substances, of marl, of sand, of clay, of vegetables.

Is it the sand which constitutes it's elementary part? But sand appears to be a secretion from the rock. Is it the rock then which is an element? But it has the appearance, in it's turn, of being an aggregation of sand, as we see it to be in masses of free stone. Whether of the two, sand or rock, was the principle of the other? and which took the precedency in the formation of the Globe? Supposing us possessed of authentic information as to this particular, what ground have we gained? There are rocks formed of aggregations of all sorts. Granite is composed of grains; marbles and calcareous stones, of the paste of shells and madrépores. There are banks of sand, composed of the wrecks of all these stones: I have seen the sand of crystal.

Shell-fish, which seem to give us some light respecting the nature of calcareous stone, by no means indicate to us the primitive origin of that substance; for they themselves form the refuse that swims in the Seas. The difficulties increase as you attempt to explain the formation of so many various bodies issuing out of the Earth, and nourished by it. In vain you call to your assistance analogies, assimilations, homogeneities, and heterogeneities. Is it not strange that thousands of species of resinous, oily, elastic, soft and combustible vegetables, should differ so entirely from the rugged and stony soil which produces them?

The Siamese Philosophers easily get rid of all embarrassment on the subject, for they admit in Nature a fifth element, which is wood. But this supplement is incapable of carrying them very far; for it is still more astonishing, that animal substance should be formed of vegetable, than that this last should be formed of fossil. Which way does it become sensible, living, and impassioned: They admit, I grant, the interposition of the Sun's action. But how is it possible that the Sun should be, in animals, the cause of any moral affection; or, if you like the

phrase better, of any passion, when we do not see it exercising a disposing influence even on the component parts of plants? For example, it's general effect is to dry that which is humid. How comes it to pass then, that in a peach exposed to it's action the pulp externally should be meltingly plump, and the nut within extremely hard; whereas the contrary takes place in the fruit of the cocoa tree, which is replenished with milk inwardly, and clothed externally with a shell as hard as a stone?

Neither has the Sun more influence on the mechanical construction of animals: their interior parts, which are most constantly moistened with humours, with blood and marrow, are frequently the hardest, such as the teeth and the bones; and the parts most exposed to the action of his heat are often very soft, as hair, feathers, the flesh and the eyes. Once more, how comes it to pass, that there is so little analogy between plants tender, ligneous, liable to putrefaction, and the Earth which produces them; and between the corals and the *madrépores* of stone, which form banks so extensive between the Tropics, and the sea water in which they are formed? To all appearance, the contrary ought to happen: the water ought to have produced soft plants, and the Earth solid plants. If things exist thus, there must undoubtedly be more than one good reason for it; I think I have a glimpse of a very tolerable one: it is this, that if these analogies actually took place, the two elements would in a short time become uninhabitable; they would soon be overwhelmed by their own vegetation. The sea would be incapable of breaking *madrépores* of wood, and the air of dissolving forests of stone.

The same doubts might be started respecting the nature of Water. This element, we allege, is formed of small globules, which roll over one another; that it is to the spherical form of it's elementary particles we ought to ascribe it's fluidity. But if these are globules, there must be between them intervals and vacuities, without which they could not be susceptible of motion. How comes it to pass then that water is incompressible? If you apply to it a strong compressing power in a tube, it will force it's way through the pores of that tube, though it be of gold; and will burst it, if of iron. Employ what efforts you please, you will find it impossible to reduce it to a smaller size. But so far from knowing the form of it's component parts, we can-

not so much as determine that of the combined whole. Does it consist in being expanded into invisible vapours in the air, as the dew, or collected into mists in the clouds, or consolidated into masses in the ice, or finally in a fluid state, as in the rivers. Fluidity, it is said, forms one of it's principal characters. Yes, because we drink it in that state, and because under this relation it interests us the most. We determine it's principal character, as we do that of all the objects of Nature, for the reason which I have already suggested, from our own most craving necessity ; but this very character appears foreign to it: for it owes it's fluidity only to the action of the heat ; if you deprive it of this it changes into ice. It would be very singular should it be made to appear, after all our fundamental definitions, that the natural state of water was to be solid, and that the natural state of earth was to be fluid: now this must actually be the case, if water owes it's fluidity only to heat, and if earth is nothing but an aggregation of sands united by different glues, and attracted to a common centre by the general action of gravity.

The elementary qualities of air are not of more easy determination. Air, we say, is an elastic body: when it is shut up in the grains of gun-powder, the action of fire dilates it to such a degree, as to communicate to it the power of hurling a globe of iron to a prodigious distance. But how could it have been, with all this elasticity, compressed into the grains of a crumbling powder? If you put even any liquid substance into a state of fermentation to a flask, a thousand times more air will be separated from it, than you could force into the vessel without breaking it. How could this air be confined in a substance soft and fluid, without disengaging itself by its own action?

The air when loaded with vapours, we farther say, is refrangible. The farther we advance to the North, the more elevated does the Sun appear over the Horizon, above the place which he actually occupies in the Heavens. The Dutch mariners, who passed the Winter of 1597, in Nova-Zembla, after a night of several months, saw the Sun re-appear fifteen days sooner than they expected his return. All this is very well. But if vapours render the air refrangible, why is there no Aurora nor twilight, nor any durable refraction of light whatever between the Tropics, not even on the Sea, where so many vapours are exhaled

by the constant action of the Sun, that the Horizon is sometimes quite involved in mist by them ?

The light is not refracted, says another Philosopher, by the vapours, but by the cold ; for the refraction of the Atmosphere is not so great at the end of Summer, as at the end of Winter, at the autumnal Equinox, as at the vernal.

I admit the truth of this observation ; however, after very hot days in Summer there is refraction to the North, as well as in our temperate climates, and there is none between the Tropics : the cold therefore does not appear to me to be the mechanical cause of refraction, but it is the final cause of it. This wonderful multiplication of light, which increases in the Atmosphere, in proportion to the intenseness of the cold, is in my apprehension a consequence of the same Law which transmits the Moon into the northern signs, in proportion as the Sun forsakes them, and which causes her to illuminate the long nights of our Pole, while the Sun is under the Horizon ; for light, be of what sort it may, is warm. These wonderful harmonies are not in the nature of the Elements, but in the will of HIM who has established them in subordination to the necessities of a being endowed with sensibility.

Fire presents to us phenomena still more incomprehensible. First of all, Is fire matter ? Matter, according to the definitions of Philosophy, is that which is divisible in length, breadth, and depth. Fire is divisible only in perpendicular length. Never will you divide a flame, or a ray of the Sun, in it's horizontal breadth. Here then is matter divisible only into two dimensions. Besides, it has no gravity, for it continually ascends ; nor levity, for it descends, and penetrates bodies ever so much below it. Fire, we are told, is contained in all bodies. But, being of a consuming nature, How does it not devour them ? How can it remain in water without being extinguished ?

These difficulties, and several others, induced *Newton* to believe that fire was not an element, but certain subtile matter put in motion. Friction it is true, and collision, elicit fire from several bodies. But how comes it that air and water, though agitated ever so much, never catch fire ? Nay, How comes it that water even gets cold by motion, though it's fluidity is entirely owing to it's being impregnated by fire ? Contrary to the nature of all other motions. Wherefore does that of fire go in a

constant state of propagation, instead of meeting a check? All bodies lose their motion by communicating it. If you strike several billiard balls with one, the motion is communicated among them, it is divided and lost. But a single spark of fire disengages from a piece of wood the igneous particles, or the subtle matter if you will, which are contained in it, and the whole together increase their rapidity to such a degree, as to make one vast conflagration of a whole forest.

We are not better acquainted with the negative qualities. Cold they tell us is produced by the absence of heat: but if cold is merely a negative quality, How is it capable of producing positive effects? If you put into water a bottle of iced wine, as I have seen done in Russia oftener than once, you perceive in a short time ice of an inch in thickness cover the outside of the bottle. A block of ice diffuses cold all over the surrounding atmosphere. Darkness nevertheless, which is a privation of light, diffuses no obscurity over surrounding light. If you open in a day of Summer a grotto at once dark and cool, the surrounding light will not be in the least impaired by the darkness which it contained; but the heat of the adjacent air will be perceptibly diminished by the cold air which issues from it. I am aware of the reply; it will be said, if there is no perceptible obscuration in the first case, it is owing to the extreme rapidity of light which replaces the darkness; but this would be increasing the difficulty instead of removing it, by supposing that darkness too has positive effects, which we have not time now to animadvert upon.

It is however on such pretended fundamental principles that most of our systems of Physics are reared. If we are in an error, or in a state of ignorance at the point of departure, it cannot be long before we go astray on the road; and it is really incredible with what facility, after having laid down our principles so slightly, we repay ourselves in consequences, in vague terms, and in contradictory ideas.

I have seen, for example, the formation of thunder explained in highly celebrated physical tracts. Some demonstrate to you that it is produced by the collision of two clouds, as if clouds or foggy vapours ever could produce a collision! Others gravely tell you, that it is the effect of the air dilated by the sudden inflammation of the sulphur and of the nitre which float in it.

But, in order to it's being capable of producing those tremendous explosions, we are under the necessity of supposing that the air was confined in a body which made some resistance. If you set fire to a great mass of gun-powder in an unconfined situation, no explosion follows. I know very well that the detonation of thunder has been imitated in the experiment of fulminating powder ; but the materials employed in the composition of it have a sort of tenacity. They undergo, on the part of the iron ladle which contains them, a resistance against which they sometimes act with so much violence as to perforate it. After all, to imitate a phenomenon is not to explain it. The other effects of thunder are explained with similar levity. As the air is found to be cooler after a thunder-storm, the nitre we are told which is diffused through the Atmosphere, is the cause of it ; but was not that nitre there before the explosion, when we were almost suffocated with heat ? Does nitre cool only when it is set on fire ? According to this mode of reckoning, our batteries of cannon ought to become glaciers in the midst of a battle, for a world of nitre is kindled into flame on such occasions ; they are under the necessity however of cooling the cannon with vinegar ; for, after having been fired off twenty times in quick succession, it is impossible to apply your hand to the piece. The flame of the nitre, though instantaneous, powerfully penetrates the metal, notwithstanding it's thickness and solidity.

The heat it is true may likewise be occasioned by the interior vibration of the parts. Whatever may be in this, the cooling of the air after a thunder-storm proceeds, in my opinion, from that stratum of frozen air which surrounds us, to the height of from twelve to fifteen hundred fathoms : and which being divided and dilated at it's base by the fire of the stormy clouds, flows hastily into our Atmosphere. It's motion determines the fire of the thunder to direct itself, contrary to it's nature, toward the Earth. It produces still farther effects, which neither time nor place permit me at present to unfold.

It was affirmed in the last age that the Earth was drawn out at the Poles ; and we are now positively told that it is flattened there. I shall not at present enter into an examination of the principles from which this last conclusion has been deduced, and the observations on which it has been supported. The flatten-

ing of the Earth at the Poles has been accounted for from a centrifugal force, to which likewise it's motion through the Heavens has been ascribed ; though this pretended force, which has increased the diameter of the Earth at the Equator, has not the power of raising so much as a straw into the air.

The flattening of the Poles they tell us has been ascertained by the measurement of two terrestrial degrees, made at a vast expense, the one in Peru, near the Equator, and the other in Lapland, bordering upon the Polar Circle.* Those experiments were made undoubtedly by men of very great capacity and reputation. But persons of at least equal capacity, and of a name equally as high in the republic of Science, had demonstrated upon other principles, and by other experiments, that the Earth was lengthened at the Poles. *Cassini* estimates at fifty leagues the length by which the axis of the Earth exceeds it's diameters, which gives to each of the Poles twenty-five leagues of elevation over the circumference of the Globe. We shall certainly enlist under the banner of this illustrious Astronomer, if we consider the testimony of the eye as of any weight ; for the shade of the Earth appears oval over it's Poles, in central eclipses of the Moon, as was observed by *Tycho Brhaé* and *Kepler*. These names are a host in themselves.

But without considering any name as an authority, where natural truths are concerned, we may conclude, from simple analogies, the elongation of the axis of the Earth. If we consider, as has been already said, the two Hemispheres as two mountains, whose bases are at the Equator, the summits at the Poles, and the Ocean, which alternately flows from one of these summits as a great river descending from a mountain, we shall have under this point of view, objects of comparison which may assist us in determining the point of elevation from which the Ocean takes it's rise, by the distance of the place where it's course terminates. Thus the summit of Chimboraco, the most elevated of the Andes of Peru, out of which the river of the Amazons issues, having a league and one-third nearly of elevation above the mouth of that river, which is distant from it in a straight line, about twenty-six degrees, or six hundred and fifty

* It is evident that the conclusion from those very measurements ought to have been, that the Earth is lengthened at the Poles. See the Explanation of the Plates.

leagues, it may be thence concluded that the summit of the Pole must be elevated above the circumference of the Earth nearly five leagues, in order to have a height proportioned to the course of the Ocean, which extends as far as the Line, ninety degrees distant, that is to say, two thousand two hundred and fifty leagues in a straight line.

If we farther consider that the course of the Ocean does not terminate at the Line, but that when it descends in Summer from our Pole, it extends beyond the Cape of Good-Hope, as far as to the eastern extremities of Asia, where it forms the current known by the name of the Westerly Monsoon, which almost encompasses the Globe under the Equator, we shall be under the necessity of assigning to the Pole, from which it takes it's departure, an elevation proportioned to the course which it is destined to perform, and of tripling at least that elevation, in order to give it's waters a sufficient declivity. I put it down then at fifteen leagues : and if to this height we add that of the ices which are there accumulated, the enormous pyramids of which over icy mountains have sometimes an elevation of one-third above the heights which support them, we shall find that the Pole can hardly have less than an elevation of the twenty-five leagues above the circumference which *Cassini* assigned to it.

Obelisks of ice ten leagues high, are not disproportioned to the centre of cupolas of ice two thousand leagues in diameter, which in Winter cover our northern Hemisphere ; and which have likewise in the southern Hemisphere, in the month of February, that is, in the very Midsummer of that Hemisphere, prominent borders, elevated like promontories, and three thousand leagues at least in circumference, according to the relation of Captain *Cook*, who coasted round them in the years 1773 and 1775.

The analogy which I establish between the two Hemispheres of the Earth, the Poles, and the Ocean which flows from them, and two mountains, their peaks, and the rivers which there have their sources, is in the order of the harmonies of the Globe, which exhibits a great number of similar harmonies on a smaller scale in the Continents, and in most islands, which are Continents in miniature.

It would appear that Philosophy has, in all ages, affected to find out very obscure causes, in order to explain the most common

effects, in the view of attracting the admiration of the vulgar, who in fact scarcely every admire any thing but what they do not comprehend. She has not failed to take the advantage of this weakness of mankind, by infolding herself in a pomposity of words, or in the mysteries of Geometry, the better to carry on the deception. For how many ages did she ring in our schools, the horror of a *vacuum* which she ascribed to Nature? How many sagacious pretended demonstrations of this have been given, which were to crown their authors with never-fading laurels, but which are now gone to the land of forgetfulness?

She disdains, on the other hand, to dwell on simple observations, which bring down to the level of every capacity the harmonies which unite all the kingdoms of Nature. For example, the Philosophy of our day refuses to the Moon all influence over vegetables and over animals. It is nevertheless certain, that the most considerable growth of plants takes place in the night-time; nay, that there are several vegetables which flower only during that season; that numerous classes of insects, birds, quadrupeds and fishes, regulate their loves, their hunting matches, and their peregrinations according to the different phases of the orb of night. But what, degrade Philosophers to the experience of gardeners and fishermen! What, condescend to think and talk like such groundlings!

If Philosophy denies the influence of the Moon over the minutest objects of the Earth, she makes it up amply by conferring on her a very extensive power over the Globe itself, without being over-scrupulous about the self-contradiction. She affirms that the Moon, in passing over the Ocean, presses upon it, and thus occasions the flux of the tides on it's shores. But how is it possible that the Moon should compress our Atmosphere, which only extends, they say, to a score of leagues at most from us? Or, admitting a subtile matter, and possessed of great elasticity, which should extend from our Seas as far as to the globe of the moon, how could this matter be compressed by it, unless you suppose it confined in a channel? Must it not, in it's actual state, extend to the right and to the left, while the action of the planet found it impossible to make itself felt on any one determinate point of the circumference of our Globe?

Besides, why does not the Moon act on lakes and seas of small extent, where there are no tides? Their smallness ought

no more to exempt them from the influence of her gravitation, than deprive them of the benefit of her light. Why are tides almost imperceptible in the Mediterranean? Wherefore do they undergo, in many places, intermittent movements, and retardations of two or three days? Wherefore, in a word, toward the North, do they come from the North, from the East, or from the West, and not from the South, as was observed with surprise by *Martens*, *Barens*, *Linschotten*, and *Ellis*, who expected to see them come from the Equator, as on the coasts of Europe?

The principal movements of the Sea, it must be allowed, take place in our Hemisphere, at the same times with the principal phases of the Moon; but we ought not from thence to conclude their necessary dependence, and still less explain it by laws which are not demonstrated. The Currents and the Tides of the Ocean proceed, as I think I have proved, from the effusion of the ices of the Poles; which depend in their turn on the variety of the course of the Sun, as he approaches less or more toward either Pole: and as the phases of the Moon are themselves regulated by the course of the Orb of Day, this is the reason why both take place at the same time.

Farther, the Moon when full has, as we have already observed, an effective and evaporating warmth: she must act therefore on the polar ices, especially when at the full.* The Academy of Sciences formerly maintained that her light did not warm, after experiments made on her rays, and on the ball of a thermometer with a burning mirror. But this is not the first error into which we have been betrayed by our books and our machinery, as we shall see when we come to speak of the decomposition of the solar ray by the prism. Neither is it the first time that an assembly of Literati have, without examination, adopted an opinion on the authority of persons who made experiments with much formality and stateliness. And this is the way that errors get into vogue. The one in question has however been completely refuted, first at Rome, and afterwards at Paris, by a very simple experiment. Some one took a fancy to expose a vessel full of water to the light of the Moon, and to

* This observation was made more than sixteen hundred years ago. "The Moon produces thaw; dissolving all ices and frosts by the humidity of her influence." *Pliny's Natural History*, book ii. chap. 101.

place one similar to it in the shade. The water in the first vessel was evaporated much sooner than that in the second.

To no purpose do we exert all our industry and ingenuity; we can lay hold of nothing in Nature, except results and harmonies: first principles universally escape us. And, what is worst of all, the methods of our Sciences have exercised a pernicious influence on our morals and on religion. It is very easy to mislead men with respect to an intelligence which governs all things, when nothing is presented to them as first causes but mechanical means. Alas! it is not by these that we shall be able to find our way toward that Heaven which we pretend to know so well. The greatest of Mankind have cast an eye thitherward as their last asylum. *Cicero* flattered himself with the hope of being, after death, an inhabitant of the Stars; and *Cesar*, from that elevation to preside over the destiny of Rome. An infinite number of other men have limited their future happiness to a superintendence of mausoleums, groves, fountains; and others to a re-union with the objects of their loves. As for us, what are we now hoping for from Earth and from Heaven, where we see nothing beyond the levers of our pitiful machines?

How! as the reward of our virtues, is our destination to mount no higher than this, to be confounded with the elements? What, thy soul, O sublime *Fenelon*! to be exhaled in inflammable air; and to have had on the Earth the sentiment of an order which did not exist even in the Heavens! How, among those Stars so luminous, is there nothing but material Globes; and in their motions, so constant and so varied, nothing but blind attractions? How! Every thing around us insensible matter and no more; and intelligence given to Man, who could give himself nothing, only to render him miserable! How! and can we have been deceived by the involuntary sentiment which makes us raise our eyes to Heaven, in the agony of sorrow, there to solicit relief! The animal on the point of closing his career, abandons himself to his natural instincts. The stag at bay seeks refuge in the most sequestered spot of the forests, content to yield up the roving spirit which animates him, under their hospitable shades. The dying bee forsakes the flowers, returns to expire at the door of her hive, and to bequeath her social instinct to her beloved Republic. And Man, following

the bent of his reasoning powers, can he no where find, in the widely extended Universe, any thing worthy of receiving his departing sighs ; not even inconstant friends, nor selfish kindred, nor an ungrateful Country, nor a soil stubborn to all his labours, nor a Heaven indifferent to crimes and to virtue ?

Ah ! it is not thus that Nature has apportioned her gifts. We bewilder ourselves with our vain Sciences. By driving the researches of our understanding up to the very principles of Nature, nay of DEITY, we have stifled in the heart all feelings of both the one and the other. The same thing has befallen us which once befel a peasant who was living happily in a little valley in the heart of the Alps. A brook which descended from these mountains fertilized his garden. For a long time he adored in tranquillity the beneficent Naiad who kept his stream perpetually flowing ; and who increased it's quantity and it's coolness as the Summer's heat increased. One day a fancy struck him that he would go and discover the place where she concealed her inexhaustible urn. To prevent his going astray, he begins with pursuing upward the track of his rivulet. Every step he takes in ascending discovers to him a thousand new objects ; plains, forests, rivers, kingdoms, boundless Oceans. Transported with delight, he proceeds in flattering hope of speedily reaching the blessed abode where the Gods preside over the destiny of this world. But after a painful scramble, he arrives at the bottom of a tremendous glacier. He no longer sees any thing around him but mists, rocks, torrents, precipices. All, all has vanished. Sweet and tranquil valley, humble roof, beneficent Naiad ! his patrimony is now reduced to a cloud, and his divinity to an enormous mass of ice.

It is thus that Science has conducted us through seductive paths to a termination so fearful. She drags after her, in the train of her ambitious researches, that ancient malediction pronounced against the first man who should dare to eat the fruit of her forbidden tree,* “ Behold, the man is become as one of us, to know good and evil. He shall not therefore put forth his hand, and take also of the tree of life, and eat, and live for ever.” What literary, political, and religious squabbles have our pretended Sciences excited ! How many men has she prevented from living even a single day !

* Genesis, chap. iv. verse 22.

The sublime genius and the pure spirit of *Newton*, assuredly could not have stood still at the boundary prescribed to a vulgar mind. On observing the clouds resorting from every quarter to the mountains which separate Italy from the rest of Europe, he would have inferred the attraction of their summits, and the direction of their chains, conformably to the basons of the Seas, and to the courses of the winds: he would thence have inferred equivalent dispositions for the different summits of the Continent and of the Islands: he would have seen the vapours arising out of the bosom of the Seas of America, and conveying through the air fecundity to the centre of Europe, fixing themselves in solid ice on the lofty pinnacles of the rocks, in order to cool the Atmosphere of hot countries; undergoing new combinations, to produce new effects; and returning in a fluid state to wash their former shores, diffusing, in their mysterious progress, unlimited abundance in a thousand different channels. He would have observed with admiration the constant impulsion communicated to so many various movements, by the action of one single luminary, the Sun, placed at the distance of thirty-two millions of leagues: and instead of fruitlessly rambling after the habitation of a Naiad at the summit of the Alps, he would have prostrated himself before that GOD whose Providence embraces the concerns of a whole Universe.

In order to study Nature with understanding and to advantage, all the parts must be viewed in their harmony and connection. For my part, I who do not pretend to be a *Newton*, am determined never to leave the borders of my rivulet. I shall set up my rest in my humble valley, and employ myself in culting some herbs and flowers; happy if I am able to form of them some garlands to decorate the entrance of that rustic Temple, which my feeble hands have presumed to rear to the Majesty of Nature! *

* The system of the harmonies of Nature, which I am proceeding to unfold, is, in my opinion, the only one which is within the reach of Man. It was first displayed by *Pythagoras* of Samos, who was the father of Philosophy, and the founder of that sect of Philosophers who have been transmitted to us under the name of Pythagoreans. Never did a succession of men arise so enlightened as those sages were in the natural Sciences; and none whose discoveries reflect higher honour on the human understanding. There existed at that time Philosophers who maintained that water, fire, air, atoms,

were the principles of things. *Pythagoras* insisted, in opposition to this doctrine, that the principles of things were the adaptations and the proportions of which the harmonies were composed, and that goodness and intelligence constituted the nature of GOD.

He was the first who gave to the Universe the epithet of *mundus*, because of it's order. He maintained that it was governed by a Providence; a sentiment perfectly conformable to the tenor of our Sacred Books and to experience. He invented the five Zones, and the obliquity of the Zodiac. He taught that the Torrid Zone was habitable. He ascribed earthquakes to the water. In fact their focuses, as well as those of volcanos, as we have already indicated, are always in the vicinity of the Sea, or of some great lake. He believed that each of the Stars was a World, containing an Earth, an Air, and a Heaven; and even in his time, this had been an anciently received opinion; for it is to be found in the verses of *Orpheus*. Finally, he discovered the square of the hypotenuse, which has served as a basis to an infinite number of geometrical theorems and solutions.

Philolaus, of Crotona, one of his disciples, maintained, that the Sun received the fire diffused over the Universe, and reverberated it, which affords a better explanation of it's nature than the perpetual emanations of light and heat which we ascribe to him, without reparation and without exhaustion. He held that Comets were Stars which re-appeared after a certain revolution. *Æcetes*, another Pythagorean, maintained the existence of two Continents, that which we inhabit and one opposite to it; an idea applicable only to America.

These Philosophers believed that the soul of Man was a harmony composed of two parts; the one reasonable, the other irrational. They placed the first in the head, and the other round the heart. They contended for it's immortality; and taught, that at the death of the man his soul returned to the Soul of the Universe. They approved of divination by dreams and augury, and condemned that which is performed by means of sacrifices. They had such a strong sense of humanity that they abstained from shedding the blood even of animals, and from eating their flesh.

Nature rewarded their virtues, and the gentleness of their manners by innumerable discoveries, and bestowed on them the glory of having as followers, *Socrates*, *Plato*, *Archytas* of Tarentum, who invented the screw, *Xenophon*, *Epaminondas*, who was educated by *Lysis* the Pythagorean, and the good king *Numa*, who taught the Tuscan priests to conjure down the thunder: in a word, she conferred on them all the lustre that Philosophy, Literature, the Military Art, or Royalty itself can communicate to the most favoured of mortals.

Pythagoras has been calumniated as having given encouragement to certain unmeaning superstitions, among others, abstinence from the use of beans &c. But as truth is frequently under the necessity of presenting herself to men under a veil, the great Philosopher, under this allegory, conveyed to his disciples an advice to abstain from public employments, because it was then the custom to make use of beans in voting at the election of Magistrates.

A very celebrated Writer of modern times, who seems to look with an evil eye on every man of illustrious reputation, has presumed to attack the character of *Xenophon*, in whom were united almost all the eminent qualities which can dignify human nature: piety, purity of manners, military skill and valour.

and eloquence. His style is so sweetly flowing, that the Greeks bestowed on him the appellation of the Athenian Bee. This great man has been lately censured on the ground of that celebrated retreat, by which he brought back ten thousand Greeks into their own Country from the very extremity of Persia, having performed a march of eleven hundred leagues through a hostile country, and amidst foes innumerable.

It has been asserted by a man of great learning, that the retreat of this renowned General was an effect of the good-nature or the piety of *Artaxerxes*; and he has of consequence treated the route which *Xenophon* pursued, by the north of Persia, as a superfluous precaution.—But is it credible that the King of Persia intentionally shewed indulgence to the Greeks, when we know, that by a perfidious piece of cruelty he had put to death twenty-five of their chief men? How was it possible for those Greeks to have returned by the same road which they went, considering that every thing in this track had been put in motion to intercept them, and that the Persians had, through it's whole extent, destroyed the villages? *Xenophon* defeated all their precautions, by directing his march through a track of which they had no foresight.

For my own part, I consider this military expedition as the most illustrious that ever was achieved; not only from the innumerable conflicts, crossing of rivers, forced marches over mountains, in the face of myriads upon myriads of enemies, through which it was accomplished; but because it was not sullied by a single act of injustice, and had no other object in view but the preservation of citizens. All that is held in high renown among the Warriors of Antiquity; have considered the retreat of the ten thousand as a master-piece in the military art. There is a single expression transmitted to us, which will forever cover it with glory, uttered in an age, and among a people by which the science of War was carried to the height of perfection, and in a situation which admitted not of dissimulation: I mean an expression of *Anthony*, when entangled in the country of the Parthians. That General, who possessed great military talents, and had at that time the command of an army of a hundred and thirteen thousand men, of whom sixty thousand were actually Roman citizens, obliged, as *Xenophon* was, to make a retreat in the face of the Parthians, and twenty times on the point of failing in his attempt, frequently exclaimed, with a sigh! *O the ten thousand!* (See *Plutarch*.)

STUDY X.

OF SOME GENERAL LAWS OF NATURE ; AND FIRST, OF PHYSICAL LAWS.

WE shall divide these Laws into Laws *physical* and Laws *moral*. We shall first examine, in the sequel of this Volume, some physical Laws common to all the Kingdoms of Nature ; and in the following Study, shall make the application of them to plants, in conformity to the Plan proposed in the commencement of this Work. We shall afterwards proceed to the consideration of *moral* Laws : and shall endeavour to unfold in these, as well as in the *physical* Laws, the means of diminishing the sum of human wretchedness.

I must make frequent appeals to the candor of my Readers. I am presuming to open a path hitherto unattempted. I dare not flatter myself with the belief that my progress and success keep pace with the ardor of my imagination, and the anticipations of my heart. But the imperfect materials which I have busied myself in collecting, may perhaps one day assist men of greater ability, and in a happier situation, in raising to Nature a temple more worthy of her. Recollect, my dear Reader, that all I promised you was the frontispiece and the ruins of it.

OF CONFORMITY.*

Though Conformity be a perception of our reason, I place it at the head of Physical Laws, because it is the first feeling which we endeavour to gratify in examining natural objects. Nay, there is a connection so intimate between the physical character of those objects, and the instinct of every being possessed

* I do not know any single word in our language which expresses closely the import of the French word *convenance*. It signifies *suitableness*, *correspondence*, the exact adaptation of one thing to another. I employ the term *conformity*, as coming the nearest to our Author's idea of any one that occurred to my mind. Whoever has attempted translation must frequently have felt the difficulty of rendering certain words by exactly equivalent words, though he was at no loss where general meaning and expression were con-

of sensibility, that colour simply is sufficient to rouse the passions of animals. A red object puts the bull into a rage, and suggests to most fowls and fishes the idea of prey. The objects of Nature display in Man a feeling of a higher order, independent of his wants ; it is that of conformity. It is by means of the multiplied conformities of Nature that Man has formed his own reason ; for *reason* means nothing else but the *relation*, or *conformity*, of things that exist. Thus, for example, if I examine a quadruped, the eye-lids, which it can raise or let fall at pleasure, present to me conformities with light ; when I look at the form of his feet, I see a conformity to the soil which he is destined to inhabit. It is impossible for me to conceive a determinate idea of these, without combining on the subject various feelings of conformity, or the want of it. Nay, the most material objects, and such as have not in the strictness of speech any decided form, cannot present themselves to us without those intellectual relations. A rustic grotto, or a steep rock, please or give pain according as they present to us the ideas of repose or of obscurity, of perspective or of precipice.

Animals have a sensibility only of objects which have particular conformities to their wants. It may be affirmed that they have in this respect a share of reason as perfect as our own. Had *Newton* been a bee, he could not with all his geometry have constructed his cell in a hive without giving it, as the honey-bee has done, six equal partitions. But Man differs from animals in his capacity of extending this sentiment of conformity to all the relations of Nature, however foreign they may be to his personal demands. It is this extension of reason which has procured for him by way of eminence the denomination of a rational animal.

It is unquestionably true that if all the particular rationality of all animals were united, the sum would probably transcend the general reason of Man ; for human reason has devised most of its arts and crafts entirely from an imitation of their produc-

cerned : for there is no perfect *convenance* between language and language. I wish it to be understood then, that wherever the word conformity occurs in the immediate sequel of this Translation, the meaning is a complete coincidence, congruity, or tallying of object with object, as a bone fitted to its socket, as the undulations of a paper check to those of its counter-check, as eye to eye, hand to hand, foot to foot ; and it applies equally to natural and to moral objects.—JL. H.

tions ; besides, all animals come into the world with their peculiar industry, whereas Man is under the necessity of acquiring his at the expense of much time and reflection ; and, as I have just observed, by imitating the industry and skill of another. But Man excels them not only by uniting in himself alone the intelligence scattered over all the rest, but by his capability of rising upward to the source of all conformities, namely to GOD himself. The only character which essentially distinguishes Man from the animal is this, He is a religious Being.

No one animal partakes with him of this sublime faculty. It may be considered as the principal of human intelligence. By it man is exalted above the instinct of the beasts, so as to be enabled to form a conception of the general plans of Nature ; and which led him to suppose an order of things, from having caught a glimpse of an Author. By it he was emboldened to employ fire as the first of agents, to cross the Ocean, to give a new face to the Earth by agriculture, to subject all animals to his empire, to establish Society on the basis of a religion, and to attempt to raise himself up to DEITY by his virtues. It was not nature, as is commonly believed, which first pointed out GOD to Man, but it is a sense of the DEITY in Man which has indicated to him the order of nature. The Savages are religious, long before they are Naturalists.

Accordingly, by the sentiment of this universal conformity, Man is struck with all possible conformities, though they may be foreign to him. He takes an interest in the history of an insect ; and if his attention is not engaged in behalf of all the insects which surround him, it is because he perceives not their relations, unless there be some *Reaumur* at hand to display them to him ; or else the constant habit of seeing them renders them insipid ; perhaps it may be some odious or contemptible prejudice ; for he is affected still more by moral than by physical ideas, and by his passions more than by his reason.

We shall farther remark, that all the sentiments of conformity spring up in the heart of Man at the sight of some useful end, which frequently has no manner of relation to his own personal wants : it follows that Man is naturally good, for this very reason, that he is rational ; seeing the aspect alone of a conformity, though entirely foreign to him, communicates a sense of pleasure. It is from this natural sentiment of goodness, that

the sight of a well-proportioned animal conveys to us agreeable sensations, which increase in proportion as the creature unfolds it's instinct. We love to see a turtle even in an aviary ; but that bird pleases still more when at large in the forest, uttering the murmurs of love from the top of an elm, or when we perceive her busily constructing in it a nest for her young with all the solicitude of her maternal tenderness.

Once more, it is from a result of this natural goodness that want of conformity communicates a painful sensation, which is always excited at sight of any thing incongruous. Thus we are shocked on looking at a monster. It gives us pain to see an animal wanting a foot or an eye. This feeling is independent of every idea of pain relatively to ourselves, let Philosophers say what they will ; for we suffer in such a case though we are assured that the animal came into the world in that defective state. We are pained at the sight of incongruity, even in insensible objects. Withered plants, mutilated trees, an ill assorted edifice, hurt our feelings. These sensations are perverted or suppressed in Man only by prejudice or by education.

OF ORDER.

A series of conformities which have a common centre constitutes order. There are conformities in the members of an animal ; but order exists only in the body. Conformity refers to the detail, and order to the combination. Order extends our pleasure by collecting a great number of conformities, and it fixes them by giving them a determination toward one centre. It discovers to us at once in a single object, a succession of particular conformities, and the leading conformity to which they all refer. Thus order gives us pleasure, as beings endowed with a reason which embraces all Nature ; and it pleases us still more perhaps, as being weak and limited creatures, capable of taking in only a single point at once.

It gives us pleasure for example to view the relations between the proboscis of a bee and the nectareous juices of flowers ; between those of her thighs hollowed into spoons, and bristled with hairs, to the fine powder of the stamina which she there collects ; between those of her four wings, to the booty with which she is loaded, (a resource by nature denied to flies which travel without a burthen, and which for this reason are furnish-

nished with two only ;*) finally, the use of a long sting which she has received for the defence of her property, and all the conformities of the organs of this small insect, which are more ingenious and in much greater number than those of the largest animals.

But the interest grows upon us when we see her covered all over with a yellow powder, her thighs pendent, and half oppressed with her burden, directing her flight through the air, across plains, rivers, and shady groves, under points of the wind, with which she is well acquainted, and alighting with a humming sound on the cavernous trunk of some aged oak. Here again we perceive a successive order, on seeing a great multitude of little individuals similar to her, coming out and going in according as the business of the hive may require. That one, whose particular conformities we have been admiring, is only a single member of a numerous Republic ; and this Republic itself is but a small Colony of the immense Nation of bees, spread over the whole Earth, from the Line up to the shores of the Frozen Ocean.

This Nation again is subdivided into different species, conformably to the various species of flowers ; for there are some which, being destined to live on flowers which have no depth, such as the radiated, are armed with five hooks, to prevent their sliding on the petals. Others on the contrary, such as the bees of America, have no stings, because they construct their hives in the trunks of prickly trees, which are very common in that part of the world : such trees accordingly are their protection. There are many other conformities among the other species of bees with which we are totally unacquainted. Nevertheless this vast Nation, so varied in it's Colonies, and whose possessions are so extensive, is but one little family of the class of flies of which we know in our own Climate alone, near six thousand species, most of them as distinct from each other, as to forms and instincts, as bees themselves are from other flies.

If we were to compare the relations of this volatile class, so numerous in itself, with all the parts of the vegetable and animal kingdoms, we should find an innumerable multitude of different

* The ichneumon, or aquatic dragon-fly, is in like manner provided with four wings, because she too was intended to fly under a load. I have seen her catch butterflies in the air.

orders of conformity ; and were we to add to them those which are presented to us in the legions of butterflies, scarabs, locusts, and other insects which likewise fly, we should multiply them to infinity. All this still would be but a small matter, compared to the various industry of the other insects which crawl, which leap, which swim, which climb, which walk, which are motionless ; the number of these is incomparably greater than that of the first : and the history of these last, added to that of the others, would after all be the history of only one puny race of this great Republic of the World, replenished as it is with innumerable shoals of fishes, and endless legions of quadrupeds, amphibious animals, and birds.

All other classes, with their divisions and subdivisions, the minutest individual of which presents a very extensive sphere of conformities, are themselves only particular conformities ; only rays and points in the general sphere, of which Man alone occupies the centre, and apprehends the immensity.

From a sense of the general order two other sentiments obviously result ; the one which throws us imperceptibly into the bosom of the DEITY, and the other, which recalls us to the perception of our wants ; the one which exhibits to us as the original cause, a Being infinitely intelligent without us, and the other, as the ultimate end, a very limited being in our own person. These two sentiments characterize the two powers of which Man is constituted, the spiritual and the corporeal. This is not the place to unfold these ; it is sufficient for my purpose to remark, that these two natural sentiments are the general sources of the pleasure which we derive from the order of Nature. Animals are affected only by the second, and that in a very limited degree.

A bee has a sentiment of the order of her hive ; but she knows nothing beyond that. She is totally ignorant of the order which regulates the ants in their nest, though she may have frequently seen them prosecuting their labours. To no purpose would she resort, in the event of her hive's being destroyed, to seek refuge as a republican in the midst of their Republic. To no purpose, in the hour of distress, would she attempt to avail herself of the qualities which she has in common with them, and which make communities to flourish, temperance, a disposition to industry, the love of Country, and above all, that of equality.

united to superior talents: she would meet from them with no hospitality, no consideration, no compassion. Nay, she would not find an asylum even among other bees of a different species: for every species has it's proper sphere assigned to it, and this by an effect of the wisdom of Nature; for if it were otherwise, the best organized species, or the strongest, would expel the others from their domains. Hence it follows, that the society of animals could not subsist independent of the passions, nor human society independent of virtue. Man alone, of all animals, possesses the sentiment of universal order, which is that of the DEITY himself; and by carrying over the whole Earth the virtues which are the fruits of it, whatever may be the differences which prejudice interposes between man and man, it is sure of alluring all hearts to itself. It was by this sentiment of universal order which governed your life, that you have become the men of all Nations, and that you interest us still, even when you are no longer with us, *Aristides, Socrates, Marcus-Aurelius, divine Fenelon*, and you, likewise, unfortunate *John James!*

HARMONY.

Nature opposes beings to each other, in order to produce between them agreeable conformities. This Law has been acknowledged from the highest Antiquity. It is to be found in many passages of the Holy Scriptures. I produce one from the Book of Ecclesiasticus: * *Omnia duplicia, unum contra unum, & non fecit quidquam deesse.* "All things are double, one against another; and He hath made nothing unperfect: one thing establisheth the good of another."

I consider this great truth as the key of all Philosophy. It has likewise been fruitful in discovery, as well as that other: *Nothing has been created in vain.* It has been the source of taste in the arts and in eloquence. Out of contraries arise the pleasures of vision, of hearing, of touching, of tasting, and all the attractions of beauty, of whatever kind it may be. But from contraries likewise arise ugliness, discord, and all the sensations which fill us with disgust. In this there is something very wonderful, that Nature should employ the same causes to produce effects so different. When she opposes contraries to each

* Ecclesiasticus, chap. xlii. ver. 24, 25.

other, painful affections are excited in us ; but when she blends them, we are agreeably affected. From the opposition of contraries spring discord, and from their union results harmony.

Let us endeavour to find in Nature some proofs of this great Law. Cold is the opposite of heat, light of darkness, earth of water ; and the harmony of these contrary elements produces effects the most delightful ; but if cold succeeds rapidly to heat, or heat to cold, most vegetables and animals exposed to such sudden revolutions are in danger of perishing. The light of the Sun is agreeable ; but if a black cloud suddenly intercepts, or bears upon the lustre of his rays, or if a gleaming flame, such as that of lightning, bursts from the bosom of a very dark night, the eye in both these cases undergoes a painful sensation. The horror of a thunder-storm is greatly increased, if the tremendous explosions are interrupted by intervals of profound silence ; and it is heightened inexpressibly, if the oppositions of those celestial fires and obscurities, of that tumult and tranquillity, make themselves felt in the gloom and silence of night.

Nature opposes, in like manner, at sea, the white foam of the billows to the black colour of the rocks, in order to announce to the mariners from afar the danger of shallows. She frequently presents to them forms analagous to destruction, such as those of ferocious animals, of edifices in ruin, or of the keels of ships turned upward. She even extracts from these awful forms hollow noises resembling groans, and broken off by long intervals of silence. The Ancients believed that they saw in the rock of Scylla a female of a hideous form, whose girdle was surrounded by a pack of dogs which barked incessantly. Mariners have given to the rocks of the Bahama channel, so noted for shipwrecks, the name of the *Martyrs*, because they present, through the spray of the billows which break on them, the horrid spectacle of men impaled, and exposed on wheels. You would even imagine that you heard sighs and sobbings issuing from these dismal shallows.

Nature employs in like manner those clashing oppositions, and those ominous signs, to express the characters of savage and dangerous animals of all kinds. The lion strolling by night through the solitudes of Africa, announces his approach from a great distance, by roarings which have a striking resemblance to the rolling of thunder. The vivid and instant-

neous flashes of fire which dart from his eyes in the dark, exhibit besides the appearance of that formidable meteor, lightning. During the Winter season the howlings of the wolves in the forests of the North resemble the whistling of the winds as they agitate the trees; the cries of birds of prey are shrill, piercing, and now and then interrupted by hollow notes. Nay, there are some which emit the sounds of a human being in pain. Such is the lom, a species of sea-fowl, which feeds on the shelvy coast of Lapland,* on the dead bodies of animals which are there put ashore: he cries like a man a-drowning.

Noxious insects exhibit the same oppositions, and the same signals of destruction. The gnat, thirsting after human blood, announces himself to the eye by the white points with which his brown-coloured body is studded, and to the ear by his shrill notes, which disturb the tranquillity of the grove. The carnivorous wasp is speckled, like the tiger, with black stripes on a yellow ground. You frequently find in our gardens, about the roots of trees which are decaying, a species of bug, of a longish form, which bears on it's red body marbled with black, the mask of a death's head. Finally, the insects which attack our persons more immediately, however small they may be, distinguish themselves by glaring oppositions of colour to the field on which they settle.

But when two contraries come to be blended, of whatever kind, the combination produces pleasure, beauty, and harmony. I call the instant, and the point of their union: *harmonic expression*. This is the only principle which I have been able to perceive in Nature; for the elements themselves, as we have seen, are not simple: they always present accords formed of two contraries to analyses multiplied without end. Thus, to resume some of the instances already adduced, the gentlest temperatures, and the most favourable in general to every species of vegetation, are those of the seasons in which cold is blended with heat, as in the Spring and Autumn. They are then productive of two saps in trees, which the strongest heats of Summer do not effect. The most agreeable production of light and darkness are perceptible at those seasons when they melt into each other, and form what Painters call the *clear-ob-*

* See John Schaeffer's History of Lapland.

scure and *half-lights*. For this reason it is, that the most interesting hours of the day are those of morning and evening: those hours, when in the beautiful imagery of *La Fontaine*, in his charming fable of *Pyramus* and *Thisbe*, the shade and the light strive for the mastery of the azure fields. The most lovely prospects are those in which land and water are lost in each other; this suggested that observation of honest *Plutarch*; namely, that the pleasantest land-journies are those which we make along the shore of the sea; and the most delightful voyages those which are a coasting along the land. You will observe these same harmonies result from savours and sounds the most opposite, in the pleasures of the palate and of the ear.

We shall proceed to examine the uniformity of this Law, in the very principles by which Nature gives us the first sensations of her works, which are colours, forms, and motions.

OF COLOURS.

I shall be carefully on my guard not to give a definition of colours, and still more, not to attempt an explanation of their Origin. Colours are, as Naturalists tell us, refractions of the light on bodies, as is demonstrated by the prism, which by breaking a ray of the Sun, decomposes it into seven coloured rays, and these display themselves in the following order; red, orange, yellow, green, blue, indigo, and violet. These are, as they will have it, the seven primitive colours. But, as has been already observed, We do not know what is primitive in Nature. I might object to them, that if the colours of objects are produced only from the refraction of the light of the Sun, they ought to disappear at the light of a taper, for the light of a taper is not decomposed by the prism: but I shall confine myself to a few reflections respecting the number and the order of those seven pretended primitive colours.

First, it is evident that four of these are compounded; for orange is made up of yellow and red; green of yellow and blue; violet, of blue and red; and indigo is nothing more than a tint of blue surcharged with black. This reduces the solar colours to three primordial; namely, yellow, red, and blue; to which if we add white, which is the colour of light, and black, which is the privation of it, we shall have five simple colours with which may be compounded all imaginable shades of colour.

I must here observe, that our philosophical machinery deceives us with it's affectation of superior intelligence, not only because it ascribes false elements to Nature, as when the prism displays compound for primitive colours, but by stripping her of such as are true ; for how many white and black bodies must be reckoned colourless, considering that this same prism does not exhibit their tints in the decomposition of the solar ray !

This instrument leads us farther into an error respecting the natural order of these very colours, by making the red ray the first in the series, and the violet ray the last. The order of colours in the prism therefore is only a triangular decomposition of a ray of cylindrical light, the two extremities of which, red and violet, participate the one of the other, without terminating it ; so that the principle of colours, which is the white ray, and it's progressive decomposition, is no longer manifested in it. I am very much disposed to believe, that it is even possible to cut out a crystal with such a number of angles, as would give to the refractions of the solar ray an order entirely different, and would multiply the pretended primitive colours far beyond the number of seven. The authority of such a polyedron would become altogether as respectable as that of the prism, if the Algebraists were to apply to it a few calculations somewhat obscure, with a seasoning of the ratiocination of the corpuscular philosophy, as they have done with regard to the effects of the triangular instrument.

We shall employ a method not quite so learned, to convey an idea of the generation of colours, and of the decomposition of the solar ray. Instead of examining them in a prism of glass, we shall consider them in the Heavens, and there we shall behold the five primordial colours unfold themselves in the order which we have indicated.

In a fine Summer's night, when the sky is serene, and loaded only with some light vapours, sufficient to stop and to refract the rays of the Sun, as they traverse the extremities of our Atmosphere, walk out into an open plain, where the first fires of *Aurora* may be perceptible. You will first observe the Horizon whiten at the spot where she is to make her appearance ; and this kind of radiance, from it's colour, has procured for it, in the French language, the name of *aube* (the dawn) from the Latin word *alba*, which signifies white. This whiteness insensibly

ascends in the Heavens, and assumes a tint of yellow, some degrees above the Horizon; the yellow, as it rises some degrees higher, passes into orange; and this shade of orange rises upward into the lively vermilion, which extends as far as the Zenith. From that point you will perceive in the Heavens, behind you, the violet succeeding the vermilion, then the azure, after it the deep blue or indigo colour, and last of all, the black quite to the westward.

Though this display of colours presents an infinite multitude of intermediate shades, which succeed each other with considerable rapidity, nevertheless there is a moment, and if my recollection of it be accurate, it is the moment when the Sun is just going to exhibit his disk, that the dazzling white is visible in the Horizon, the pure yellow, at an elevation of forty-five degrees; the fire colour in the Zenith; the pure blue forty-five degrees under it, toward the West; and in the very West, the dark veil of night still lingering on the Horizon. At least I think I have remarked this progression between the Tropics, where there is scarcely any horizontal refraction to make the light prematurely incroach on the darkness as in our Climates.

J. J. Rousseau observed to me one day, that though the field of those celestial colours be blue, the yellow tints which melt away into it do not produce by that mixture the colour of green, as is the case in our material colours, when these two shades are blended. But I replied, that I had frequently perceived green in the Heavens, not only between the Tropics but over the Horizon of Paris.* That colour in truth is hardly ever seen with us, but in some fine Summer evenings. I have likewise seen, in the clouds of the Tropics, all the colours perceptible on the earth, particularly at sea, and in stormy weather. You may then see some of them copper-coloured, some of the colour of the smoke of a tobacco-pipe, some brown, reddish, black, grey, chestnut, livid, the colour of a heated oven's mouth. As to those which appear there in fine weather, some are so lively and brilliant that no palace can exhibit any thing to vie with them, were it enriched with all the gems of the Great Mogul,

* I have several times observed green in the Heavens at sea, and once, at least, over the horizon of the river Delaware, in Philadelphia: It was early in the morning, in the latter end of the month of June, 1802. The appearance I think, is more common than is generally supposed.—B. S. B.

Sometimes the trade-winds from the North-East or South-East, which constantly blow there, card the clouds through each other like so many tufts of silk ; then sweep them away to the West, crossing and re-crossing them over one another, like the osiers interwoven in a transparent basket. They throw over the sides of this chequered work, the clouds which are not employed in the contexture, and which are in no small number, roll them up into enormous masses, as white as snow, draw them out along their extremities in form of a crupper, and pile them upon each other like the Cordeliers of Peru, moulding them into the shape of mountains, of caverns and of rocks ; afterwards as evening approaches, they grow somewhat calm, as if afraid of deranging their own workmanship. When the Sun comes to set behind this magnificent netting, you see a multitude of luminous rays transmitted through each particular interstice, which produce such an affect, that the two sides of the lozenge illuminated by them, have the appearance of being begirt with a fillet of gold, and the other two, which are in the shade, seem tinged with a superb ruddy orange. Four or five divergent streams of light, emanated from the setting Sun up to the Zenith, clothe with fringes of gold the undeterminate summits of this celestial barrier, and proceed to strike with the reflexes of their fires the pyramids of the collateral aerial mountains, which then appear to consist of silver and vermillion. At this moment of the evening are perceptible, amidst their redoubled ridges, a multitude of valleys extending into infinity, and distinguishing themselves at their opening by some shade of flesh or of rose-colour.

These celestial valleys present, in their different contours, inimitable tints of white, melting away into white, or shades lengthening themselves out, without mixing over other shades. You see here and there issuing from the cavernous sides of those mountains, tides of light precipitating themselves in ingots of gold and silver, over rocks of coral. Here it is a gloomy rock, pierced through and through, disclosing beyond the aperture the pure azure of the firmament ; there it is an extensive strand, covered with sands of gold, stretching over the rich ground of Heaven ; poppy-coloured, scarlet, and green as the emerald.

The reverberation of those western colours diffuses itself over the Sea, whose azure billows it glazes with saffron and purple,

The mariners, leaning over the gunwale of the ship, admire in silence those aerial landscapes. Sometimes this sublime spectacle presents itself to them at the hour of prayer, and seems to invite them to lift up their hearts with their voices to the Heavens. It changes it's appearance every instant: what was just now luminous, becomes in a moment coloured simply; and what is now coloured will by and by be in the shade. The forms are as variable as the shades; they are by turns islands, hamlets, hills clothed with the palm-tree; vast bridges stretching over rivers; fields of gold, of amethysts, of rubies, or rather nothing of all this, they are celestial colours and forms which no pencil can pretend to imitate, and which no language can describe.

It is very remarkable, that all travellers who have at various seasons ascended to the summits of the highest mountains on the Globe, between the Tropics and beyond them, in the heart of the Continent, or in Islands, never could perceive, in the clouds below them, any thing but a gray and lead-coloured surface, without any variation whatever as to colour, being always similar to that of a lake. The Sun notwithstanding illuminated those clouds with his whole light; and his rays might there combine without obstruction, all the laws of refraction to which our systems of Physics have subjected them. From this observation it follows, and I shall repeat it in another place, because of it's importance, that there is not a single shade of colour employed in vain, through the whole extent of the Universe; that those celestial decorations were made for the level of the Earth, and that their magnificent point of view is taken from the habitation of Man.

These admirable concerts of lights and forms which manifest themselves only in the lower region of the clouds, the least illuminated by the Sun, are produced by laws with which I am totally unacquainted. But let their variety be what it may, the whole are reducible to five colours: yellow appears to be a generation from white; red a deeper shade of yellow; blue, a tint of red greatly strengthened; and black, the extreme tint of blue. It is impossible to entertain a doubt respecting this progression, if you observe in the morning, as I have mentioned, the expansion of the light in the Heavens. You there see those five colours, with their intermediate shades, generating each other nearly in this order: white, sulphur yellow, lemon yellow,

yolk of egg yellow, orange, aurora colour, poppy red, full red, carmine red, purple, violet, azure, indigo and black. Each of those colours seems to be only a strong tint of that which precedes it, and a faint tint of that which follows; thus the whole together appear to be only modulations of a progression, of which white is the first term, and black the last.

In this order, whereof the two extremes, white and black, that is, light and darkness, produce in harmonizing, so many different colours, you will remark, that the red colour holds the middle place, and that it is the most beautiful of the whole in the judgment of all Nations. The Russians, when they would describe a beautiful girl, say she is red. They call her *crastna devitsa*: red and beautiful being with them synonymous terms. In Mexico and Peru red was held in very high estimation. The most magnificent present which the emperor *Montezuma* could devise for *Cortez* was a necklace of lobsters, which naturally had that rich colour.* The only demand made upon the Spaniards by the King of Sumatra, on their first landing in his country, and presenting him with many samples of the commerce and industry of Europe, was some corals and scarlet coloured stuffs;† and he promised to give them in return all the spiceries, and other merchandize of India, for which they might have occasion.

There is no such thing as carrying on trade to any advantage with the Negroes, the Tartars, the Americans, and the East-Indians, but through the medium of red cloths. The testimonies of travellers are unanimous respecting the preference universally given to this colour. Of this I could produce proofs innumerable, were I not afraid of being tedious. I have indicated the universality of this taste, merely in the view of demonstrating the falsehood of the philosophic axiom, which asserts that tastes are arbitrary, or which amounts to the same thing, that there are in nature no laws for beauty, and that our tastes are the effects of prejudice. The direct contrary of this is the truth; it is prejudice that corrupts our natural tastes, which would otherwise be the same over the whole Earth. From a prejudice of this kind the Turks prefer green to every other

* See Herrera.

† See General History of Voyages by the Abbe *Prevost*.

colour, because, according to the tradition of their Theologians, this was the favourite colour of *Mahomet*, and his descendants alone, of all the Turks, have the privilege of wearing the green turban.

But from a similar though opposite prejudice, the Persians their neighbours despise green, because they reject the traditions of those Turkish Theologians, and accordingly do not acknowledge that consanguinity of their Prophet, being followers of *Ali*.

From another chimera, yellow appears to the Chinese the most distinguished of all colours, because it is that of their emblematical dragon. Yellow is, in China, the imperial colour, as green is in Turkey. The Chinese nevertheless, if we may depend on the authority of *Isbrants-Ides*, represent their Gods and Heroes on the stage with their faces stained a blood colour.* All these Nations, the political colour excepted, consider red as the most beautiful, which is sufficient to establish, with respect to it, an unanimity of preference.

But without dwelling longer on the variable testimony of Man, we have only to appeal to that of Nature. It is with red that Nature heightens the most brilliant parts of the most beautiful flowers. She has given a complete cloathing of it to the rose, the Queen of the Garden: she has bestowed this tint on the blood, which is the principle of life in animals: she invests most of the feathered race in India with a plumage of this colour, especially in the season of love. There are very few birds on which she does not then bestow some shade at least of this rich hue.† Some have their heads covered with it, such as those which are called Cardinals; others have a breast-plate of it, a necklace, a capuchin, a shoulder-knot. There are some which preserve entirely the gray or brown ground of their plumage.

* Journey from Moscow to China, page 141.

† This assertion is rather too broad. There are, certainly, many birds upon which Nature even during the season of love, has not bestowed the smallest shade, or spot, of red. But, on the other hand, the instances in support of *St. Pierre's* assertion are so numerous, that we ought not to wonder, that he has advanced it so much in the style of a general, or universal rule. When we take a superficial view of our King-bird (*lanius tyrannus*) we see no red upon it; but by blowing aside, or carefully removing, the feathers of it's neck, we discover a beautiful *macula* of red, or crimson.—B. S. B

but glazed over with red, as if they had been rolled in carmine. Others are besprinkled with red, as if you had blown a scarlet powder over them. Together with this, some have a mixture of small white points which produces a charming effect. A little bird of India, called *Bengali*, is painted in this manner.

But nothing can be more lovely than a turtle-dove of Africa, who bears on her pearl-gray plumage, precisely over the place of the heart, a bloody spot, consisting of different kinds of red blended, perfectly resembling a wound: it seems as if this bird, dedicated to Love, was destined to wear her master's livery, and had served as a mark to his arrows. What is still more wonderful, these rich coralline tints disappear in most of those birds as soon as the season of love is over, as if they were robes of ceremony, lent them by the benevolence of Nature only during the celebration of their nuptials.

The red colour, situated in the midst of the five primordial colours, is the harmonic expression of them by way of excellence; and the result, as has been said, of the union of two contraries, light and darkness. There are besides, tints extremely agreeable, compounded of the oppositions of extremes. For example, of the second and fourth colour, that is, of yellow and blue, is formed green, which constitutes a very beautiful harmony, and which ought perhaps to possess the second rank in beauty among colours, as it possesses the second in their generation. Nay, green appears in the eyes of many persons, if not the most beautiful tint, at least the most lovely, because it is less dazzling than red, and more congenial to the eye.*

* It is harmony which renders every thing perceptible, just as monotony makes every thing to disappear. Not only are colours the harmonic consonances of light: but there is no one coloured body whose tint Nature does not heighten by the contrast of the two extreme generative colours, which are white and black. Every body detaches itself by means of light and shade, the first of which is a-kin to the white, and the second to the black. Every body accordingly bears upon it a complete harmony.

This is not the effect of chance. Were we enlightened, for example, by a luminous air, we should not perceive the form of bodies; for their outlines, their profiles, and their cavities, would be overspread with an uniform light, which would cause their prominent and retreating parts to disappear. With a Providence, therefore, completely adapted to the weakness of our vision, the AUTHOR of Nature has made the light to issue from a single point of Heaven: and with an intelligence that equally challenges our admiration, He has given a motion of progression to the Sun, who is the source of that light.

I shall insist no longer on the other harmonic shades which may be deduced, in conformity to the laws of their generation, from colours the most opposite ; and of which might be formed accords and concerts, such as Father *Castel* produced from his celebrated Harpsichord. I must however remark, that colours may have a powerful influence on the passions ; and that they, as well as their harmonies, may be referred to the moral affections. For example, making red the point of departure, which is the harmonic colour super-eminently, and proceeding toward white in an ascending progression, the nearer you approach to this first term, the more lively and gay are the colours. You will have in succession the poppy, the orange, the yellow, the lemon, the sulphur, the white. On the contrary, the farther you proceed from red toward black, the sadder and more lugubrious are the colours ; for this is the progression ; purple, violet, blue, indigo, and black.

In the harmonies which may be formed on both sides by the union of opposite colours, the more that the tints of the ascending progression predominate, the more lively will be the harmonies produced ; and the contrary will take place, in proportion as the colours of the descending harmony shall prevail. From this harmonic effect it is that green, being compounded of yel-

in order to form, with the shades, harmonies varying every instant. He has likewise modified that light on terrestrial objects in such a manner, as to illuminate both immediately and mediately, by refraction and by reflection, and to extend it's tints, and it's harmonies, with those of shade, in a way that no words can express.

J. J. Rousseau one day made this observation : " Painters can give the appearance of a body in relief, to a smooth surface ; I should be very glad to see them give the appearance of a smooth surface to a raised body." I made no reply at the moment ; but having since reflected on the solution of this problem in optics, I by no means consider the thing as impossible. The whole that is necessary, according to my idea, is to destroy one of the harmonic extremes which render bodies prominent. For instance, if the object aimed at were to flatten a bass-relief, it would be necessary to paint the cavities white, or the prominent parts black. Accordingly, as they employ the harmony of the clare-obscure, to give the appearance of a solid body to a plane surface, they might employ the monotony of one single tint to make what is actually raised and solid to disappear, and become to the eye a plain surface. In the first case, painting renders that visible which is not tangible ; in the second, we should have a body that might be touched without being visible. This last deception would be fully as surprizing as the other

low and blue, is so much more gay, as the yellow has the ascendant, and sad in proportion as the blue predominates.

Farther, from this harmonic influence it is, that white trans-fuses most gaiety into all other tints, because it is light itself. Nay, it produces, from opposition, a most delightful effect in the harmonies, which I call melancholy ; for, blended with violet, it gives the delicious hue of the lilach flower ; mixed with blue it makes azure, and with black produces pearl-gray ; but melted away into red, it exhibits the rose-colour, that enchanting tint which is the flower of life. On the other hand, according to the predominance of black in colours which are gay, the effect produced is more mournful than would have resulted from unmixed black. This becomes perceptible on blending it with yellow, orange, and red, which are thereby rendered dull and gloomy colours. Red gives life to every tint into which it is infused, as white communicates gaiety, and black sadness.

If you would wish to produce effects entirely opposite to most of those which I have been just indicating, you have only to place the extreme colours closely by each other, without mingling them. Black opposed to white, produces the most mournful and the harshest effect. Their opposition is a badge of mourning among most Nations, as it is the signal of impending destruction in the tempestuous appearances of the Heavens, and in the commotions of the Ocean. The yellow too, opposed to black, is the characteristic of many dangerous animals, as the wasp, the tyger, and several others.....I do not pretend to insinuate that the women have not the skill of employing to advantage, in their dress, those opposite colours ; but they are called in as an embellishment only on account of the contrasts which they form with the colour of their complexion ; and as the red predominates there, it follows that the opposite colours are advantageous to them, for harmonic expression is never stronger than when found between the two extremes which produce it. We shall offer a few thoughts hereafter on this part of Harmony, when we come to speak of contrasts, and of the human figure.

It would be ridiculous to affect ignorance of the objections which may be started against the universality of these principles. We have represented white as a gay, and black as a sad colour. Nevertheless certain Negro Nations represent the

Devil as white ; the inhabitants of the Peninsula of India, in token of mourning, rub their forehead and temples with the powder of sandal-wood, the colour of which is a yellowish white. The Navigator *La Barbinois*, who in his voyage round the world has as well described the manners of China as those of our sea-officers and of several European Colonies, says that white is the colour of mourning among the Chinese. From these instances it might be concluded, that the feeling of colour must be arbitrary, as it is not the same in all Nations.

I venture to offer the following reply to these objections. It has already been proved by evidence, that the Nations of Africa and Asia, however black they may be, prefer white women to those of every other tint. If there be any Negro Nations who paint the Devil white, this may be easily accounted for, from the strong feeling which they have of the tyranny which the whites exercise over them. White accordingly having become with them a political colour, ceases to be a natural one. Besides, the white in which they paint their Devil is not a white, beautifully harmonious like that of the human figure, but a dead white, a chalk white, such as that with which our painters illuminate the figures of phantoms and ghosts in their magical and infernal scenes.

If this dazzling colour is the expression of mourning among the Indians and Chinese, the reason is, it contrasts harshly with the black skin of those Nations. The Indians are black. The skin of the southern Chinese is much sun-burnt. They derive their religion and their leading customs from India, the cradle of the Human race, the inhabitants of which are black. Their outward garments are of a gloomy colour ; a great part of their dress consists of black sattin ; the covering for their under extremities is black boots ; the ornamental furniture of their houses consists, in a great measure, of that beautiful black varnished ware which we import from their country. White must therefore produce a harsh dissonance with their furniture, their dress, and above all, with the dusky colour of their skin.

If those nations were to wear a black habit in mourning, as we do, be their colour ever so deep, it would not form a clashing opposition in their dress. The expression of grief, accordingly, is precisely the same with them as with us. For if we, in a season of mourning, oppose the black colour of our clothes

to the white colour of our skin, in order thence to produce a funeral dissonance, the Southern Nations oppose, on the contrary, the white colour of their garments to the dusky colour of their skin, in order to produce the same effect.

The variety of taste admirably confirms the universality of the principles which we have laid down respecting the causes of harmony and dissonance. It farther demonstrates, that the agreeableness or disagreeableness of a colour resides not in one single shade, but in the harmony, or in the clashing contrast of two opposite colours.

We might find proofs of those laws multiplied without end in Nature, to which Man ought ever to have recourse in all his doubts. She opposes harshly, in hot countries as in cold, the colours of dangerous and destructive animals. Venomous reptiles are universally painted in gloomy colours. Birds of prey are universally of an earthly hue opposed to yellow, and white specks on a dark ground, or dark spots on a light ground. Nature has given a yellow robe, striped with dusky brown, and sparkling eyes, to the tyger lying in ambush under the shade of the forests of the South: and she has tinged with black the snout and paws, and with blood-colour the throat and eyes of the white bear, and thereby renders him apparent, notwithstanding the whiteness of his fur, amidst the snows of the North.

OF FORMS.

Let us now proceed to the generation of forms. If I am not mistaken, the principles of these, like those of colours, are reducible to five, namely, the line, the triangle, the circle, the ellipse, and the parabola.

The line generates all forms, as the ray of light does all colours. It goes on progressively, like the other, in it's generations, step by step, producing, first, by three fractions, the triangle which of all figures contains the smallest surfaces under the greatest of circuits. The triangle afterward, composed itself of three triangles at the centre, produces the square, which consists of four triangles from the central point; the pentagon, which consists of five; the hexagon, which consists of six; and so of the rest of the polygons, up to the circle, which is composed of a multitude of triangles, whose summits are at it's

centre, and the bases at it's circumference: and which, contrary to the triangle, contains the greatest of surfaces under the smallest of peripheries. The form which has hitherto always been going on progressively, commencing with the line relatively to a centre, up to the circle, afterwards deviates from it, and produces the ellipse, then the parabola, and finally all the other widened curves, the equations of which may all be referred to this last.

So that under this aspect the indefinite line has no common centre: the triangle has three points in it's bounding lines, which has a common centre; the square has four, the pentagon five, the hexagon six, and the circle has all the points of it's circumference regulated conformably to one common and only centre. The ellipse begins to deviate from this regulation, and has two centres; and the parabola, as well as the other curves which are analogous to it, have centres innumerable contained in their several axes, from which they remove farther and farther, forming something like funnels.

On the supposition of this ascending generation of forms, from the line through the triangle up to the circle, and their descending generation from the circle through the ellipse to the parabola, I deduce from these five elementary forms all the forms of Nature, as with five primordial colours I compose all the possible shades of colour.

The line presents the slenderest form, the circle presents the fullest, and the parabola the most obliquely fluted. In this progression it may be remarked, that the circle which occupies the middle between these two extremes is the most beautiful of all the elementary forms, as red is the most beautiful of all the primordial colours. I presume not to say, with certain ancient Philosophers, that this form must be the most beautiful, because it is the figure of the Stars, which, however, would be no such contemptible reason; but, to employ only the testimony of our senses, it is the most grateful to both the eye and the touch; it is likewise the most susceptible of motion; finally, what is no mean authority in the case of natural truths, it is considered as the most conformable to the taste of all Nations, who employ it in their ornaments and in their architecture; and it is particularly conformable to the taste of children, who give it the preference to every other, in the instruments of their amusement.

It is very remarkable, that these five elementary forms have the same analogies to each other which the five primordial colours have among themselves ; so that if you proceed to their ascending generation, from the sphere toward the line, you will have forms angular, lively, and gay, which shall terminate in the straight line, and of which Nature composes so many radiations and expansions of figure, in the Heavens and on the Earth, so agreeable to behold. If, on the contrary, you descend from the sphere to the excavations of the parabola, you will be presented with a gradation of cavernous forms, which are so frightful in abysses and precipices.

Farther, if you join the elementary forms to the primordial colours, term for term, you will observe their principal character mutually strengthen each other, at least in the two extremes, and in the harmonic expression of the centre : for the two first terms will give the white ray, which is the ray of light itself ; the circular form, united to the red colour, will produce a figure analogous to the rose, composed of spherical portions with carmine tints, and from the effect of this double harmony deemed, in the judgment of all Nations, the most beautiful of flowers. Finally black, added to the vacuity of the parabola, increases the gloom of retreating and cavernous forms.

With these five elementary forms may be composed figures as agreeable as the shades which are produced from the harmonies of the five primordial colours. So that the more there shall enter into those mixed figures, of the two ascending terms of the progression, the more light and gay such figures will be ; and the more that the two descending terms shall predominate, the more heavy and dull will be the forms. Thus the form will be so much the more elegant, as the first term, which is the straight line, shall have the predominance. For example, the column gives us pleasure, because it is a long cylinder, which has the circle for it's basis, and two straight lines, or a quadrilateral figure of considerable length, for it's elevation. But the palm-tree, of which it is an imitation, pleases still more, because the stellated and radiant forms of it's palms, likewise taken from the straight line, constitute a very agreeable opposition with the roundness of it's stem ; and if to this you unite the harmonic form by way of excellence, namely, the circular, you will add inexpressibly to the grace of this beautiful tree. This

likewise Nature, who knows much more of the matter than we, has taken care to do, by suspending, at the basis of it's divergent boughs, sometimes the oval date and sometimes the rounded cocoa-nut.

In general, as often as you employ the circular form you will greatly enhance the agreeableness of it, by uniting it with the two contraries of which it is composed; for you will then have a complete elementary progression. The circular form alone presents but one expression, the most beautiful of all, in truth; but united to it's two extremes, it forms, if I may so express myself, an entire thought. It is from the effect which thence results, that the vulgar consider the form of the heart to be so beautiful, as to compare to it every other beautiful and interesting object. That is beautiful as a heart, say they.* This heart-form consists at it's basis of a projecting angle, and above of a retreating angle; there we have the extremes: and in it's collateral parts of two spherical portions; there is the harmonic expression.

It is farther from these same harmonies that long ridges of mountains, overtopped by lofty peaks of a pyramidical form, separated from each other by deep valleys, delight us by their gracefulness and majesty. If to these you add rivers meandering below, radiating poplars waving on their banks, flocks of cattle and shepherds, you will have vales similar to that of Tempe. The circular forms of the mountains in such a landscape are placed between their extremes, namely, the promineny of the rocks and the cavity of the valleys. But if you separate from it the harmonic expressions, that is, the circular wavings of those mountains, together with their peaceful inhabitants, and allow the extremes only to remain, you will then have the dreary prospect of Cape-Horn; angular, perpendicular rocks, hanging over fathomless abysses.

If to these you add oppositions of colour, as that of snow on the summits of the dusky rocks, the foam of the billows break-

* Is not our Author here indulging fancy rather than following Nature. If this be an idea and expression of the common people, it must be the commonalty of a particular country. *Heart* is, perhaps, universally used to express fondness, affection, desire; but to represent the *form* of that organ as *beautiful*, nay the *essence* of beauty, is surely a violent stretch of imagination.—H. II.

ing on the lurid shore, a pale sun in a gloomy sky, torrents of rain in the midst of Summer, tremendous squalls of wind succeeded by sullen calms, a European vessel on her way to spread desolation over the islands of the South-Sea,* running upon a rock when it is beginning to grow dark, firing from time to time guns the signal of distress, the noise of which the echoes of those horrid deserts reverberate, the terrified Patagonian running in amazement to his cave; and you will have a complete view of that land of desolation, covered over with shades of death.

OF MOVEMENTS.

It remains that I suggest a few reflections on the subject of motions. Of these we shall in like manner distinguish five which are fundamental: self-motion or the rotation of a body round itself, which supposes no change of place, and which is the principle of all motion; such is perhaps that of the Sun; after that, the perpendicular, the circular, the horizontal, and the state of rest. All movements whatever may be referred to these five. Nay you will remark that Geometricians, who represent them likewise by figures suppose the circular motion to be generated of the perpendicular and the horizontal, and to make use of their language, produced by the diagonal of their squares.

I shall not insist on the analogies of the generation of colours and forms to those of the generation of movements; and which actually exist between the white colour, the straight line, and self motion, or rotation; between the red colour, and spherical form, and circular motion; between darkness, vacuity, and rest. I shall not pretend to unfold the infinite combinations which might result from the union or opposition of the corresponding terms of each generation, and of the filiations of these same terms. I leave to the Reader the pleasure of following up this

* Would not the effect of this dreadful picture have been considerably strengthened, had our Author represented his European vessel as attempting to double Cape-Horn, *on her return* from spreading devastation over the South-Seas, and making shipwreck on that dreary coast, *after* the scene of blood was acted? In this case we should have had the striking and instructive representation of the connection between Human Guilt and Divine Justice: of the clashing collision of criminality and vengeance.—H. H.

idea, and of forming to himself, with these elements of Nature, harmonies the most enchanting, with the additional charm of novelty. I shall confine myself at present to a few hasty observations respecting motion.

Of all movements the harmonic or circular motion, is the most agreeable. Nature has diffused it over most of her works, and has rendered even the vegetables, which are fastened down to the earth, susceptible of it. Our plains present frequent images of this, when the winds form, on the meadow, or on the corn-field, a series of undulations resembling the waves of the sea ; or when they gently agitate, on the sides of the lofty mountains, the towering tops of the trees, waving them about in segments of a circle. Most birds form portions of great circles as they play through the airy expanse, and seem to take pleasure in tracing, as they fly, an infinite variety of curves and spiral motions. It is remarkable that Nature has bestowed this agreeable style of flying on many of the inoffensive species of the feathered race, not otherwise to be prized for the exquisiteness of either their song or their plumage. Such among others is the flight of the swallow.

The case is very different with respect to the progressive movements of ferocious or noxious animals. They advance leaping, springing, and join to movements sometimes extremely slow, others violently rapid : this is observable in the motion of the cat lying in wait to catch a mouse. Those of the tiger are exactly similar, in his approaches upon his prey. The same discordancy is observable in the flight of carnivorous birds. The species of owl called the grand-duke floats through the midst of a tranquil sky, as if the wind carried him this way and that. Tempests present, in the Heavens, the same characters of destruction. You sometimes perceive the stormy clouds moving in opposite directions, and with various degrees of velocity ; now they fly with the rapidity of lightning, while others remain immovable as the rock. In the tremendous hurricanes of the West-Indies, the explosion is always preceded and followed by a dead calm.

The more that a body possesses of self-motion, or of rotation, the more agreeable it appears, especially when to this movement is united the harmonic or circular motion. It is for this reason that trees whose leaves are immovable, such as the aspin and

poplar, have more grace than other forest trees when agitated by the wind. They please the eye by the balancing of their tops, and by presenting in turn the two surfaces of their foliage, which display two different greens. They are likewise agreeable to the ear, from their imitation of the bubbling of water. From the effect of self-motion it is, that, every moral idea out of the question, animals interest us more than vegetables, because they have the principle of motion within themselves.

I do not believe there is a single spot on the Earth in which there is not some body in motion. Frequently have I been in the midst of vast solitudes, by day and by night, and in seasons of perfect tranquillity, and I have heard always some noise or another. Often in truth it was only the sound of a bird flying, or of an insect stirring a leaf; but sound always supposes motion.

Motion is the expression of life. In this you see the reason why Nature has multiplied the causes of it in all her works. One of the great charms of a landscape is to see objects in motion; and this is the very thing which the pictures of most of our great Masters frequently fail to express. If you except such of them as represent tempests, you will find every where else their forests and their meadows motionless, and the waters of their lakes congealed. Nevertheless, the inversion of the leaves of trees presenting a grey or white underside; the undulations of the grass in the valleys and on the ridges of the mountains; those which ruffle the smooth surface of the waters and the foam which whitens the shores, recall with inexpressible pleasure, in a burning summer-scene, the breath so gentle and so cooling of the zephyrs. To these might be added, with infinite grace, and with powerful effect, the movements peculiar to the animals which inhabit them; for example, the concentric circles which the diving-bird forms on the surface of the water; the flight of a sea fowl taking it's departure from a hillock, with neck advancing and legs thrown backward, and of two white turtles skimming side by side in the shade along the skirts of a forest; the balancing of a wagtail on the extremity of the foliage of a rush, bending under his weight. It might be possible even to represent the motion and the weight of a loaded carriage toiling up a hill, by expressing the dust of the crushed pebbles which rise up behind it's wheels. Nay, I will go so far as

to say, that I think the effects of the singing of birds, and of the echoes, might be rendered perceptible by the expression of certain characters which it is not necessary here to unfold.

So far are most of our Painters, even among those whose talents are most conspicuous, from paying attention to accessories so agreeable, that they omit them in subjects of which those accessories form the principal character. For example, if they represent a chariot at full speed, they take pains to exhibit every spoke of the wheels. The horses indeed are galloping, but the chariot is immoveable. The wheels of a carriage however that that is running with a rapid motion, present but one single surface; all their spokes are confounded to the eye. It was not thus that the Ancients, our masters, in every branch of Art, imitated Nature. *Pliny* tells us that *Apellus* had so exactly painted chariots with four horses, that the wheels appeared to be turning round. In the curious list which he has transmitted to us of the most celebrated pictures of antiquity, and still viewed with admiration at Rome in his time, he particularly mentions one which represented women spinning wool, whose spindles seemed actually to whirl. Another was held in high estimation,* “in which were represented two light-armed soldiers, the one of whom is so heated with running in battle, that you see him sweat; and the other, who is laying down his arms, appears so exhausted, that you imagine you hear him panting.” I have seen in many modern pictures machines in motion, wrestlers and warriors in action, but in no one of them did I ever find attention paid to these effects so simple and so expressive of the truth of Nature. Our painters consider them as petty details, beneath the notice of a man of genius. Nevertheless these petty details are traits of character.

Marcus Aurelius, who possessed fully as much genius as any modern whatever, has very judiciously observed, that in many cases it is on such minutenesses the attention fixes, and from the contemplation of these the mind derives the most pleasure. “The sight of the shrivelling ripe figs,” says he, “the bushy eye-brows of a lion, the foaming of an enraged wild-boar, the reddish scales which rise on the crust of bread coming out of the oven, give pleasure.”

* *Pliny's Natural History.* Book. xxxvii. chap. 10 and 11

This pleasure may be accounted for in various ways: first, from the weakness of the human mind, which in contemplating any object whatever, fixes on some one principal point; and then, from the design of Nature, who likewise, in all her works, presents to us one single point of conformity, or of discordancy, which is as it were it's centre. The mind increases it's affection, or it's aversion, for this characteristic trait, the more simple that it is, and in appearance contemptible. This is the reason that, in eloquence, the shortest expressions always convey the strongest passions; for all that is requisite, as we have hitherto seen, in order to excite a sensation of pleasure or of pain, is to determine a point of harmony or of discord, between two contraries: now, when these two contraries are opposites in nature, and are so besides in magnitude and in weakness, their opposition redoubles, and consequently their effect.

The effect is farther heightened, if to this is joined, especially, the surprize of seeing striking occasions of hope or of fear produced by objects of apparently small importance; for every physical effect produces in Man a moral feeling. For example, I have seen many pictures, and read many descriptions of battles, which attempted to inspire horror by representing an infinite variety of instruments of destruction, and a multitude of dying and dead persons, wounded in every possible manner. The less did I feel myself moved, the more I perceived the machinery employed to move me: one effect destroyed the other. But I have been greatly affected by reading, in *Plutarch*, the death of *Cleopatra*.

That great Painter of calamity represents the Queen of Egypt meditating, in the tomb of *Anthony*, on the means of eluding the triumph of *Augustus*. A peasant brings her, with permission of the guards on duty at the entrance of the tomb, a basket of figs. The moment that the clown has retired she hastens to uncover the basket, and perceives the asp, which by her contrivance had been introduced among the figs, to put a period to her miserable life. This contrast, a woman being the subject, of liberty and slavery, of royal power and annihilation, of voluptuousness and death; those leaves and fruits amidst which she perceives only the head and sparkling eyes of a puny reptile, prepared to terminate interests of such "great pith and

“moment;” and which she thus addresses, *There you are!* all these oppositions one after another make you shudder.

But in order to render the person itself of *Cleopatra* interesting, there is no occasion to represent her to yourself as our Painters and Sculptors exhibit her, an academic figure destitute of expression; a strapping virago, robust and replete with health, with large eyes turned toward Heaven, and wearing round her large and brawny arm a serpent twisted, like a bracelet. This is by no means a representation of the little, voluptuous Queen of Egypt, who had herself been carried, as I before mentioned, packed up in a bundle of goods, on the shoulders of *Apollodorus*, to keep a stolen assignation with *Julius Cesar*; at another time walking the streets of Alexandria by night with *Anthony*, disguised as a sempstress, rallying him, and insisting that his jests and style of humour smelt strongly of the soldier. Still less is it a representation of the unfortunate *Cleopatra*, reduced to the extreme of calamity, dragging up by means of cords and chains, with the assistance of two of her women, through the window of the monument in which she had taken refuge, with her head downward, without ever letting go her hold, says *Plutarch*, that very *Anthony*, covered over with blood, who had run himself through with his own sword, and who struggled with all his remaining strength to get up and expire in her arms.

Details are by no means to be despised; they are frequently traits of character. To return to our Painters and Sculptors; if they withhold the expression of motion to landscapes, to wrestlers, and to chariots in the course, they bestow it on the portraits and the statues of our great Men and Philosophers. They represent them as Angels sounding the alarm to judgment, with hair flying about, with wild wandering eyes, the muscles of the face in a state of convulsion, and their garments fluttering in the wind. These, they tell us, are the expressions of genius. But persons of genius and great Men are not bedlamites. I have seen some of their portraits on antiques. The medals of *Virgil*, of *Plato*, of *Scipio*, of *Epaminondas*, nay, of *Alexander*, represent them with a serene and tranquil air. It is the property of inanimate matter, of vegetables, and of mere animals, to obey all the movements of Nature; but it is that of

a great Man, in my opinion, to have his emotions under command, and it is only in so far as he exercises this empire, that he merits the name of Great.

I have made a short digression from my subject, in order to suggest a few lessons of *conformity* to Artists, who I am well aware will find it much more difficult to execute than it is easy for me to criticise. God forbid that any thing I have said should give a moment's pain to men whose works have so frequently given me exquisite pleasure. It was simply my wish to caution the ingenious against the academic manner which fetters them, to stimulate them to tread in the steps of Nature, and to pursue that track as far as genius can carry them.

This would be the place to speak of Music, for sounds are movements merely : but persons of much greater ability than I dare pretend to, have treated this noble Art with consummate skill. If any foreign testimony could farther confirm me in the certainty of the principles which I have hitherto laid down, it is that of Musicians of the highest reputation, who have restricted harmonic expression to three sounds. I might, as they have done, reduce to three terms the elementary generations of colours, of forms, and of motions ; but if I am not mistaken, they themselves have omitted, in their fundamental basis, the generative principle, which is *sound* properly so called, and the negative term, which is silence ; especially as this last produces effects so powerful in the movements of Music.

These proportions might be extended to the progressions of tasting, and it might be demonstrated, that the most agreeable of them have similar generations ; as we know by experience to be the case with regard to most fruits, whose different stages of maturity successively present five savours, namely, the acid, the sweet, the sugary, the vinous, and the bitter. They are acid while growing, sweet as they ripen, sugary in a state of perfect maturity, vinous in their fermentation, and bitter in a state of dryness. Farther, we should find the most agreeable of these savours, namely, the sugary, is that which occupies the middle place in this progression, of which it is the harmonic term ; that from it's nature it forms new harmonies, by a combination with it's extremes ; for the beverages which are most grateful to the palate, consist of acid and sugar, as the refreshing liquors prepared with citron juice ; or of sugar and bitter, such as coffee.

But while I am endeavouring to open new paths to Philosophy, it is no part of my intention to present new combinations to voluptuousness.

Though I have a thorough conviction of the truth of these elementary generations, and am able to support them with a multitude of proofs which I have collected in the tastes of polished and of savage Nations, but which time permits me not at present to exhibit ; it would however be a matter of no surprize to me, should many of my Readers dissent from what I have advanced. Our natural tastes are perverted from our infancy by prejudices which determine our physical sensations, much more powerfully than these last give direction to our moral affections. More than one Churchman considers violet as the most beautiful of colours, because his Bishop wears it : more Bishops than one give scarlet the preference, because it is the Cardinal's colour ; and more than one Cardinal undoubtedly would rather be dressed in white, because this colour is appropriated to the Head of the Church. A soldier frequently looks upon the red as the most beautiful of all ribbons ; but his superior officer prefers the blue. Our temperaments, as well as our conditions, have an influence upon our opinions.

Gay people prefer lively colours to every other ; persons of sensibility those which are delicate ; the melancholy assume the dusky. Though I myself consider red as the most beautiful of colours, and the sphere as the most perfect of forms ; and though I am bound more than any other man strenuously to adhere to this order, because it is that of my system, I prefer to the full red, the carmine colour, which has a slight shade of violet ; and to the sphere, the oval, or elliptical form. It likewise appears to me, if I may venture to say so, that Nature has bestowed by way of preference both of these modifications on the rose, at least before it is completely expanded. Farther, I like violet flowers better than white, and still much better than such as are yellow. I prefer a branch of lilach in bloom to a pot of gilly-flower,* and a Chinese daisy, with it's disk of a smoky

* Dr. Johnson tells us that *Gilly-flower* is a corruption in orthography for *July-flower*. With due respect to so great an Etymologist, this I take to be a mistake. The flowering of the plant is by no means limited to the month of July. The English term is derived from the French word *Giroflie*, (the clove-plant) ; every one knows the striking analogy between the savour of that spice and the smell of the Gilly-flower.—H. H.

yellow, it's rumpled shaggy down, it's violet and grave petals, to the most flashy cluster of sun-flowers in the Luxemburg.

I am persuaded that I have these in common with many other persons, and that if we form a judgment of men from the colour of their clothes, by far the majority is rather serious than gay. I am likewise of opinion that Nature, for to her we must ever have recourse in order to be assured that we are right, gives most of her physical beauties a tendency to melancholy. The plaintive notes of the nightingale, the deep shades of the forest, the sober lustre of the Moon, inspire no gaity, nevertheless they interest us, and that very deeply. I feel much more emotion in contemplating the setting than the rising Sun. In general we are pleased with gay and sprightly beauties, but we are melted and touched only by those which are melancholy.

I shall endeavour in another place to unfold the causes of these moral affections. They stand in connection with laws more sublime than any physical laws : while these last amuse our senses, the others speak to the heart, and calmly admonish us that Man is ordained to a much higher destination.

It is very possible that I may be mistaken in the order of those generations, and may have transposed their terms. But all that I from the beginning proposed, was to open some new paths into the Study of Nature. It is sufficient for my purpose that the effect of these generations is generally acknowledged. Men more enlightened will establish the filiations of them in a more luminous order. All that I have hitherto said on this subject, or hereafter may say, is reducible to this great Law : Every thing in Nature is formed of contraries : it is from their harmonies that the sentiment of pleasure results, and out of their oppositions issues the sentiment of pain.

This Law, as we shall see, extends also to morals. Every truth, the truths of fact excepted, is the result of two contrary ideas. From this it follows, that as often as we decompound a truth by dialectics, we divide it into the two ideas of which it is constituted ; and if we confine ourselves to one of its elementary ideas, as to a detached principle, and deduce consequences from it, we shall convert it into a source of endless disputation ; for the other elementary idea will abundantly supply consequences diametrically opposite to the person who is disposed to pursue them ; and these consequences are themselves

susceptible of contradictory decompositions, which go on without end. The Schools are admirably adapted to instruct us how to manage this process ; and thither are we sent to form our judgment. There are we taught to separate the most evident truths not only into two, but, as *Hudibras* says, into four. If, for example, some one of our Logicians, observing that cold had an influence on vegetation, should think proper to maintain that cold is the only cause of it, and that heat is even inimical to it, he would take care no doubt to quote the efflorescences and the vegetations of ice, the growth, the verdure, and the flowering of mosses in Winter ; plants burnt up by the heat of the Sun in Summer, and many other effects relative to his thesis. But his antagonist, availing himself on his side of the influences of Spring, and of the ravages of Winter, would clearly demonstrate that heat alone gives life to the vegetable world. But the truth is, after all, that heat and cold combined form one of the principles of vegetation, not only in temperate climates, but to the very heart of the Torrid Zone.

It may confidently be affirmed, that all the disorders in both Physics and Morals, are neither more nor less than the clashing opposition of two contraries. If men would pay attention to this Law, there would be a speedy end put to most of their wranglings and mistakes ; for it may be urged, that every thing being composed of contraries, whoever affirms a simple proposition is only half right, as the contrary proposition has equally an existence in nature.

There is perhaps in the World but one intellectual truth, pure, simple, and which does not admit of a contrary idea ; namely, the existence of GOD. It is very remarkable, that those who have denied, it, adduce no other proofs to support their negation, but the apparent disorders of Nature, the extreme principles of which alone they contemplated : so that they have not demonstrated that no God existed, but that He was not intelligent, or that He was not good. Their error accordingly proceeds from their ignorance of natural Laws. Besides, their arguments have been founded for the most part on the disorders of men, who exist in an order widely different from that of Nature, and who alone, of all beings endowed with perception, have been committed to their own direction,

As to the nature of GOD, I know that faith itself presents Him to us, as the harmonic principle by way of supreme excellence, not only with relation to all that surrounds Him, of which He is the Creator and Mover, but even in his essence divided into three persons. *Bossuet* has extended these harmonies of DEITY to Man, by tracing in the operations of the human Soul some consonancy to the Trinity, of which it is the image. These lofty speculations are, I acknowledge, infinitely above my reach. Nay I am filled with admiration to think that the DIVINITY should have permitted beings so weak, and so transitory as we are, to take so much as a glimpse of his omnipotence on this Earth; and that he should have veiled under combinations of matter the operations of his infinite Intelligence, in order to adapt it to our perception. A single act of his will was sufficient to call us into being; the slightest communication of his work is sufficient to illuminate our reason; but I have a thorough persuasion, that if the smallest ray of his divine essence were to communicate itself directly to us in a human body, we must be annihilated.

OF CONSONANCES.

Consonances are repetitions of the same harmonies. They increase our pleasures by multiplying them, and by transferring the enjoyment of them to new scenes. They farther communicate pleasure, by rendering it perceptible to us that the same Intelligence has presided over the different plans of Nature, as it presents to us throughout, similar harmonies. Consonances accordingly confer more pleasure than simple harmonies, because they convey to us the sentiments of extension, and of Divinity, so congenial to the nature of the human Soul. Natural objects excite in us a certain degree of satisfaction, only in so far as they awaken and display an intellectual feeling.

We find frequent examples of consonances in Nature. The clouds of the Horizon frequently imitate, on the Sea, the forms of mountains and the aspects of land, and this so exactly as often to deceive the most experienced mariners. The waters reflect from their heaving bosom the heavens, the hills, the forests. The echoing rocks in their turn repeat the murmuring of the waters. As I was walking one day in the Pais de Caux along the sea-side, and considering the reflexes of the shore in the

bosom of the water, I was not a little astonished to hear other waves emitting a dying sound behind me. I turned round, and perceived only a high and steep shore, the echoes of which were repeating the noise of the waves. This double consonance appeared to me wonderfully agreeable. You would have said there was a mountain in the sea, and a sea in the mountain.

Those transportations of harmony from one element to another, communicate inexpressible pleasure. Nature has multiplied them accordingly, with boundless liberality, not only in fugitive images but by permanent forms. She has repeated, in the midst of the Seas, the forms of Continents in those of Islands; most of which, as we have seen, have peaks, mountains, lakes, rivers, and plains, proportioned to their extent, as if they were little Worlds. On the other hand, she represents in the midst of the Land the basons of the vast Ocean, in mediterraneans and in great lakes, which have their shores, their rocks, their isles, their volcanos, their currents, and sometimes a flux and reflux peculiar to themselves, and which is occasioned by the effusions from icy mountains, at the basis of which they are commonly situated, as the currents and tides of the Ocean are by those of the Poles.

It is singularly remarkable that the most beautiful harmonies are those which have the most consonances. Nothing in the World, for example, is more beautiful than the Sun, and nothing in nature is so frequently repeated as his form and his light. He is reflected in a thousand different manners by the refractions of the air, which every day exhibit him above all the horizons of the Globe, before he is actually risen, and for some time after he has set; by the parhelia which reflect his disk, sometimes twice or thrice in the misty clouds of the North; by the rainy clouds, in which his refracted rays trace an arch shaded with a thousand various colours; and by the water, whose reflexes exhibit him in an infinite number of places where he is not, in the bosom of meadows, amidst flowers besprinkled with dew, and in the shade of green forests. The dull and inert earth too reflects him in the specular particles of gravels, of micas, of crystals, and of rocks. It presents to us the form of his disk and of his rays, in the disks and petals of the pyramids of radiated flowers with which it is covered. In a word, this beautiful star has multiplied himself to infinity with

varieties of which we know nothing, in the innumerable stars of the firmament which he discovers to us as soon as he quits our Horizon; as if he had withdrawn himself from the consonances of the earth only to display to the delighted eye those of Heaven.

From this Law of consonance it follows, that what is best and most beautiful in Nature is likewise most common and the most frequently repeated. To it we must ascribe the varieties of species in each genus, which are so much the more numerous in proportion as that genus is useful. For example, there is no family in the vegetable kingdom so necessary as that of the gramineous, on which subsist not only all the quadrupeds, but endless tribes of birds and insects; and there is no one accordingly whose species are so varied. We shall take notice, in the Study on Plants, of the reasons of this variety. I shall only remark in this place, that it is in the gramineous families Man has found the great diversity of nutritious grains from which he derives his chief subsistence; and that from reasons of consonance not only the species, but several of the genera nearly approach to each other, in order that they may present similar services to Man under Latitudes entirely different. Thus the millet of Africa, the maize of Brazil, the rice of Asia, the palm-sago of the Moluccas, the trunks of which are filled with alimentary flour, are in consonance with the corns of Europe. We shall find consonances of another kind in the same places, as if it had been the intention of Nature to multiply her benefits by varying only the form of them, without changing almost any thing of their qualities. Thus in our gardens, what a delightful and beneficial consonancy there is between the orange and the citron trees, the apple and the pear, the walnut and the filbert; and in our farm-yards, between the horse and the ass, the goose and the duck, the cow and the she-goat.

Farther, each genus is in consonancy with itself, from difference of sex. There are however between the sexes contrasts which give the greatest energy to their loves, from the very opposition of contraries, from which, as we have seen, all harmony takes its birth: but without the general consonancy of form which is between them, sensible beings of the same genus never would have approached each other. Without this, one sex would have for ever remained a stranger to the other. Before each of them could have observed what the other possessed that

corresponded to it's necessities, the time of reflection would have absorbed that of love, and perhaps have extinguished all desire. It is consonancy which attracts, and contrast which unites them. I do not believe that there is in any one genus an animal of one sex entirely different from one of the other in exterior forms ; and if such differences are actually found, as certain Naturalists pretend, in several species of fishes and insects, I am fully persuaded that Nature placed the habitation of the male and of the female very close to each other, and planted their nuptial couch at no great distance from their cradle.

But there is a consonancy of forms much more intimate still than even that of the two sexes, I mean the duplicity of the organs which exists in each individual. Every animal is double. If you consider his two eyes, his two nostrils, his two ears, the number of his legs and arms disposed by pairs, you would be tempted to say, here are two animals glued the one to the other, and united under the same skin. Nay the parts of his body which are single, as the head, the tail, and the tongue, appear to be formed of two halves, compacted together by seams. This is not the case with regard to the members properly so called : for example, one hand, one ear, one eye, cannot be divided into two similar halves ; but the duplicity of form in the parts of the body distinguishes them essentially from the members : for the part of the body is double, and the member is single : the former is always single and alone, and the latter always repeated. Thus the head and the tail of an animal are parts of it's body, and the legs and ears of it are members.

This Law of Nature, one of the most wonderful and one of the least observed, destroys at one blow all the hypotheses which introduce chance into the organization of beings ; for, independently of the harmonies which it presents, it doubles at once the proofs of a Providence, which did not deem it sufficient to give one principal organ to each animal, adapted to each element in particular, such as the eye for the light of the Sun, the ear for the sounds of the air, the foot for the ground which is to support it ; but determined, besides, that every animal should have each of those organs by pairs.

Certain Sages have considered this admirable duplication as a pre-disposition of Providence, in order that the animal might have a substitute always at hand to supply the loss of one of the

double organs, exposed as they are to so many accidents ; but it is remarkable that the interior parts of the body, which at first sight appear to be single, present on closer examination a similar duplicity of forms, even in the human body, where they are more confounded than in other animals. Thus the five lobes of the lungs, one of which has a kind of division : the fissure of the liver ; the supernal separation of the brain, by the reduplication of the *dura-mater* ; the *septum lucidum*, similar to a leaf of talc, which separates the two anterior ventricles of it ; the two ventricles of the heart ; and the divisions of the other *viscera* announce this double union, and seem to indicate that *the very principle of life is the consonance of two similar harmonies.**

There farther results from the duplicity of organs, a much more extensive range of utility than if they had been single. Man by the assistance of two eyes can take in at once more than half of the Horizon ; with a single one he could scarcely have embraced a third part. Provided with two arms he can perform an infinite number of actions which he never could have accomplished with one only ; such as raising upon his head a load of considerable size and weight, and clambering up a tree. Had he been placed upon one leg, not only would his position be much more unsteady than upon two, but he would be unable to walk ; his progressive motion would be reduced to crawling or hopping. This method of advancing would be entirely discordant to the constitution of the other parts of his body, and to the variety of soils over which he is destined to move.

* Each organ is itself in opposition with the element for which it is destined ; so that from their mutual opposition arises a harmony which constitutes the pleasure enjoyed by that organ. This is very remarkable, and confirms the principles which we have laid down. Thus the organ of vision adapted principally to the Sun, is a body singularly opposite to him, in that it is almost entirely aqueous. The Sun emits luminous rays ; the eye, on the contrary, is surrounded by a dusky eye-brow which overshadows it. The eye is besides, veiled with a lid which can be raised and dropped at pleasure ; and it further opposes to the whiteness of the light a tunic entirely black, called the *uvea*, which clothes the extremity of the optic nerve.

The other parts of the body present, in like manner, oppositions to the action of the elements to which they are adapted. Accordingly the feet of animals which scramble among rocks are provided with pincers, as those of tigers and lions. Animals which inhabit cold countries are clothed with warm furs, and so on. But with all this, we must not always reckon on finding these contraries of the same species in every animal. Nature possesses an infinite variety of means for producing the same effects, conformably to the necessities of every individual.

If nature has given a single exterior organ to animals, such as the tail, it is because the use of it being extremely limited extends but to a single action to which it is fully equivalent. Besides, the tail, from it's situation is secured against almost every danger. Farther, hardly any but the very powerful animals have a long tail, as bulls, horses, and lions. Rabbits and hares have it very short. In feeble animals, which have one of considerable length, as the thorn-back, it is armed with prickles, or else it grows again if it happens to be torn off by an accident, as in the case of the lizard. Finally, whatever may be the simplicity of it's use, this is remarkable, it is formed of two similar halves, as the other parts of the body.

There are other interior consonances, which collect diagonally, if I may use the expression, the different organs of the body, in order to form but one only and single animal of it's two halves. I leave to Anatomists the investigation of this incomprehensible connection : but be their knowledge ever so extensive, I much doubt whether they will ever be able to trace the windings of this labyrinth. Why, for instance, should the pain which attacks a foot make itself felt sometimes in the opposite part of the head, and *vice versa*? I have seen a very astonishing proof of this consonance in the case of a serjeant who is still living, I believe, in the Hospital of Invalids. This man having a fencing bout one day with a comrade, who as well as himself made use of his undrawn sword, received a thrust in the lachrymal angle of the left eye, which immediately deprived him of his senses. On coming to himself, which did not happen till several hours afterward, he was found to be completely paralytic in his right leg and right arm, and no medical assistance has ever been able to restore the use of them.*

* This soldier was of Franche-Comté. I never saw him but once, and I have forgotten his name as well as that of the regiment to which he belonged ; but I have not lost the recollection of his virtuous conduct, which was reported to me on undoubted authority. When the accident above related sent him to the Invalids, he remembered that, in his capacity of serjeant, he had inveigled, at the instigation of his captain, in a country village, a young fellow to enlist who was the only son of a poor widow, and who was killed three months afterward in an engagement. The serjeant recollecting this act of cruelty and injustice, formed the resolution of abstaining from wine. He sold his allowance as a pensioner in the Hospital of the Invalids, and remitted the amount every six months to the mother whom he had robbed of her son.

I must here observe, that the cruel experiments every day made on brutes, in the view of discovering these secret correspondencies of Nature, serve only to spread a thicker veil over them; for their muscles, contracted by terror and pain, derange the course of the animal spirits, accelerate the velocity of the blood, put the nerves into a state of convulsion, and tend much rather to unhinge the animal economy than to unfold it. These barbarous means, employed by our modern Physics, have an influence still more fatal on the morals of those who practise them; for, together with false information, they inspire them with the most atrocious of all vices, which is cruelty.*

If Man may presume to put questions to Nature respecting the operations which she is pleased to conceal, I should prefer the road of pleasure to that of pain. Of the propriety of this sentiment I was witness to an instance, at a country-seat in Normandy. Walking in one of the adjoining fields with a young gentleman who was the proprietor of them, we perceived bulls a-fighting; he ran up to them; with his staff brandished, and the poor animals instantly gave up their contention. He presently went up to the most ferocious of the tribe, and began to tickle him with his fingers at the root of the tail. The animal, whose eyes were still inflamed with rage, became motionless, with outstretched neck, expanded nostrils, transpiring the air with a satisfaction which most amusingly demonstrated the intimate correspondence between this extremity of his body and his head.

The duplicity of organs is farther observable even in vegetables, especially in their essential parts, such as the *antheræ* of the flowers, which are double bodies; in their petals one half of which corresponds exactly to the other; in the lobes of their seed, &c. A single one of these parts however appears to me sufficient for the expansion and the generation of the plant.

* There is much less of good sound sense, than of humanity, tenderness, and amiableness, in these observations. Indeed, such observations could not have proceeded from one profoundly versed in the experimental department of animal physics. But such "barbarous means," such "cruel experiments," ought not to be laid to the charge of our modern Physics only. In the school of Alexandria, under the auspices of Seleucus Nicanor, we read of experiments which neither the laws, nor the genius, nor the feelings, of our time would permit to be made.—B. S. B.

This observation might be extended to the very leaves, the two halves of which are correspondent in most vegetables ; and if any one of them recedes from this order, it is undoubtedly for some particular reason, well worthy of investigation.

These facts confirm the distinction which we have made between the parts and the members of a body ; for in the leaves where their duplicity occurs the vegetative faculty is usually to be found, which is diffused over the body of the vegetable itself. So that if you carefully replant those leaves, and at the proper season, you will see the complete vegetable thence reproduced. Perhaps it is because the interior organs of the tree are double that the principle of vegetative life is diffused even over it's slips, as we see it in a great number which sprout again from one branch. Nay there are some which have the power of perpetuating themselves by cuttings simply. Of this we have a noted instance in the memoirs of the Academy of Sciences. Two sisters on the death of their mother became heiresses of an orange-tree. Each of them insisted on having it thrown into her allotment. At length, after much wrangling, and neither of them being disposed to resign her claim, it was settled that the tree should be cleft in two, and each take her half. The orange-tree accordingly underwent the judgment pronounced by *Solomon* on the child. It was cleft asunder ; each of the sisters replanted her own half, and, wonderful to be told ! the tree which had been separated by unsisterly animosity received a new clothing of bark from the benignant hand of Nature.

It is this universal consonance of forms which has suggested to Man the idea of symmetry. He has introduced it into most of his works of art, and particularly into Architecture, as an essential part of order. To such a degree in fact is it the work of intelligence and of combination, that I consider it as the principal character by which we are enabled to distinguish all organized bodies from such as are not so, and are only results of a fortuitous aggregation, however regular their assemblage may appear ; such as those which produce crystallizations, efflorescences, chemical vegetations, and igneous effusions.

It was in conformity to these reflections that, on considering the Globe of the Earth, I observed with the greatest surprize, that it too presented, like every organized body, a duplicity of

form. From the beginning it had been my thought that this Globe being the production of an Intelligence, order must of necessity pervade it. I had discerned and admired the utility of islands, and even of that of banks, of shelves, and of rocks, to protect the parts of the Continents which are most exposed to the Currents of the Ocean, at the extremities of which they are always situated. I had in like manner discerned the utility of bays, which are, on the contrary, removed from the Currents of the Ocean, and hollowed into deep retreats to shelter the discharge of rivers, and to serve by the tranquillity of their waters as an asylum to the fishes, which in all seas retire thither in shoals, to collect the spoils of vegetation, and the alluvions of the Land, there disgorged by the rivers. I had admired in detail the proportions of their different fabrics, but had formed no conception of their combination. My mind was bewildered amidst such a multiplicity of cuttings and carvings, of land and sea ; and I should, without hesitation, have ascribed the whole to chance, had not the order which I perceived in each of the parts suggested to me the possibility that there might exist order also in the totality of the Work.

I am now going to display the Globe under a new aspect. The Reader will, I hope, forgive this digression, which exhibits to him one little fragment of the materials I had laid up for a geographical structure, but which tends to prove the universality of the natural Laws whose existence I am endeavouring to establish. I shall be as usual rapid and superficial : but it is a matter of very inferior importance to myself, should I enfeeble ideas which I have not been permitted to arrange in their natural order, provided I am enabled to transmit the germ of them into a head superior to my own.

I first endeavoured to find out consonances between the northern and southern halves of the Globe. But so far from discovering resemblances between them, I perceived nothing but oppositions ; the northern being, if I may so express myself, a terrestrial Hemisphere only, and the southern a maritime ; and so different from each other, that the Winter of the one is the Summer of the other, and that the seas of the first Hemisphere seem to be opposed to the lands and to the islands which are scattered over the second. This contrast presented to me another analogy with an organized body : for, as we shall see in

the following articles, every organized body has two halves in contrast, as there are two in consonance.

I found in it then, under this new aspect, something like analogy with an animal, the head of which should have been to the North, from the attraction of the magnet peculiar to our Pole, which seems there to fix a *sensorium*, as in the head of an animal: the heart under the Line, from the constant heat which prevails in the Torrid Zone, and which seems to determine this as the region of the heart; finally, the excretory organs in the southern part, in which the greatest Seas, the vast receptacles of the alluvions of Continents, are situated; and where we likewise find the greatest number of volcanos, which may be considered as the excretory organs of the Seas, whose bitumens and sulphurs they are incessantly consuming. Besides, the Sun, who sojourns five or six days longer in the Northern Hemisphere, seemed to present to me a farther and a more marked resemblance to the body of an animal, in which the heart, the centre of heat, is somewhat nearer to the head than to the lower extremities.

Though these contrasts appeared to me sufficiently determinate to manifest an order on the Globe, and though I perceived something similar in vegetables, distinguished as they are into two parts, opposite in functions and in forms, such as the leaves and the roots; I was afraid of giving scope to my imagination, and of attempting to generalize, through the weakness of the human mind, the Laws of Nature peculiar to each existence, by extending them to kingdoms, which were not susceptible of the application.

But I ceased to doubt of the general order of the Globe, when, with two halves in contrast, I found two others in consonance. I was struck with astonishment, I must confess, when I observed in the duplicity of forms which constitute it, members exactly repeated on that side and on this.

The Globe, if we consider it from East to West, is divided, as all organized bodies are, into two similar halves, which are the Old and the New World. Each of their parts mutually corresponds in the eastern and western Hemisphere; sea to sea, island to island, cape to cape, peninsula to peninsula. The lakes of Finland and the Gulf of Archangel, correspond to the lakes of Canada and Baffin's-bay; Nova Zembla to Greenland; the

Baltic to Hudson's-bay ; the islands of Great-Britain and Ireland, which cover the first of these mediterraneans, to the Islands of Good-Fortune and Welcome, which protect the second ; the Mediterranean, properly so called, to the Gulf of Mexico, which is a kind of mediterranean formed in part by islands. At the extremity of the Mediterranean we find the isthmus of Suez in consonance with the isthmus of Panama, placed at the bottom of the Gulf of Mexico. Conjoined by those isthmuses, the peninsula of Africa presents itself in the Old World, and the peninsula of South-America in the New. The principal rivers of these divisions of the Globe front each other in like manner ; for the Senegal discharges itself into the Atlantic, directly opposite to the river of the Amazons. Finally, each of these peninsulas, advancing toward the South Pole, terminates in a cape equally noted for violent tempests, the Cape of Good-Hope and Cape Horn.

There are besides between these two Hemispheres a variety of other points of consonance, on which I shall no longer insist. These different particulars, it is admitted, do not correspond exactly in the same Latitudes ; but they are disposed in the direction of a spiral line winding from East to West, and extending from North to South, so that these corresponding points proceed in a regular progression. They are nearly of the same height, setting out from the North, as the Baltic and Hudson's bay ; and they lengthen in America in proportion as it advances toward the South. This progression makes itself farther perceptible along the whole length of the Old Continent, as may be seen from the form of it's Capes, which, taking the point of departure from the East, lengthen so much the more toward the South as they advance toward the West ; such as the Cape of Kamtschatka in Asia ; Cape Comorin in India ; the Cape of Good-Hope in Africa ; and finally, Cape-Horn in America.

These differences of proportion are to be accounted for from this, that the two terrestrial Hemispheres are not projected in the same manner ; for the Old Continent has it's greatest breadth from East to West, and the New has it's greater extent from North to South ; and it is manifest that this difference of projection has been regulated by the AUTHOR of Nature, for the same reasons which induced him to bestow double parts on animals, in order that, if necessity required, the one might supply

what was deficient in the other, but principally that they might be of mutual assistance.

If, for example, there existed only the Ancient Continent, with the South Sea alone, the motion of that Sea being too much accelerated under the Line by the regular winds from the East, would, after having surrounded the Torrid Zone, advance with incredible fury, and attack tremendously the land of Japan : for the size of the billows of a Sea is always in proportion to it's extent. But from the disposition of the two Continents, the billows of the great eastern current of the Indian Ocean are partly retarded by the Archipelagos of the Moluccas and Philippine islands ; they are still further broken by other islands, such as the Maldivia, by the Capes of India, and by that of Good Hope, which throws them back toward the South. Before they reach Cape Horn they have to encounter new obstacles from the Current of the South Pole, which then crosses their course, and the change of the monsoon, which totally destroys the cause of the commotion at the end of six months. Thus there is not a single Current, be it easterly or northerly, which pervades so much as a quarter of the Globe, in the same direction. Besides, the division of the parts of the Globe into two is so necessary to it's general harmony, that if the channel of the Atlantic Ocean, which separates them, had no existence, or were in part filled up, according to a supposition once entertained, by the great island Atlantis,* all the oriental rivers of America, and all the occidental of Europe would be dried up ; for those rivers owe their supplies only to the clouds which emanate from the Sea. Besides, the Sun enlightening on our side only one terrestrial Hemisphere, the mediterraneans of which would disappear, must burn it up with his rays ; and at the same time, as he warmed on the other side a Hemisphere of water only, most of the islands of which would sink of course, because the quantity of that Sea must be increased by the subtraction of ours, an immensity of vapour would arise and go merely to waste.

It would appear that, from these considerations, Nature has not placed in the Torrid Zone the greatest length of the Conti-

* A fabulous island imagined by *Plato*, as has been demonstrated by many learned men, allegorically to represent the Atheian Government.

nents, but only the mean breadth of America and of Africa, because the action of the Sun would there have been too vehement. She has placed there, on the contrary, the longest diameter of the South Sea, and the greatest breadth of the Atlantic Ocean, and there she has collected the greatest quantity of islands in existence. Farther, she has placed in the breadth of the Continents which she has there lengthened out, the greatest bodies of running water that are in the World, all issuing from mountains of ice: such as the Senegal and the Nile, which issue from the mountains of the Moon in Africa; the Amazon and the Oroonoko, which have their sources in the Cordeliers of America.

Again, it is for that she has multiplied, in the Torrid Zone, and it's vicinity, lofty chains of mountains covered with snow, and that she directs thither the winds of the North Pole and of the South Pole, of which the Trade-winds always partake. And it is very remarkable, that several of the great rivers which flow there are not situated precisely under the Line, but in regions of the Torrid Zone, which are hotter than the Line itself. Thus the Senegal rolls it's stream in the vicinity of Zara, or the Desert, which, if we may credit the concurring testimony of all travellers, is the hottest part of Africa.

From all this taken together, we have a glimpse of the necessity of two Continents, to serve mutually as a check to the movements of the Ocean. It is impossible to conceive how Nature could have disposed them otherwise, than by extending one of them lengthways and the other in breadth, in order that the opposed Currents of their Ocean might balance each other and that there might thence result a harmony adapted to their shores and to the islands contained in their basons.

Were we to suppose these two Continents projected circularly from East to West, under the two temperate Zones, the circulation of the Sea contained between the two would be, as we have seen, too violently accelerated by the constant action of the East wind. There could be no longer any communication by Sea from the Line toward the Poles; consequently no icy effusions of that Ocean, no tides, no cooling, and no renovation of it's waters. If we suppose, on the contrary, both Continents extended from North to South as America is, there would be no longer any oriental Current in the Ocean; the two halves of

each Sea would meet in the midst of their channel, and their polar effusions would there encounter each other with an impetuosity of commotion, of which the icy effusions precipitated from the Alps, with all the dreadful ravages which they commit, convey but a faint idea. But by the alternate and opposite Currents of the Seas the icy effusions of our Pole proceed in Summer to cool Africa, Brasil, and the southern parts of Asia, forcing it's way beyond the Cape of Good-Hope, by the Monsoon which then carries the Current of the Ocean toward the East; and during our Winter the effusions of the South-Pole proceed toward the West, to moderate on the same shores the action of the Sun, which is there unremitting. By means of these two spiral motions of the Seas, similar to those of the Sun in the Heavens, there is not a single drop of water but what may make the tour of the Globe, by evaporation under the Line, dissolution into rain in the Continent, and congelation under the Pole. These universal correspondencies are so much the more worthy of being remarked, that they enter into all the plans of Nature, and present themselves in the rest of her Works.

From any other imaginable order would result other inconveniencies, which I leave the reader to find out. Hypotheses *ex absurdo* are at once amusing and useful; they change, it is true, natural proportions into caricatures; but they have this advantage, that by convincing us of the weakness of our understanding they impress us with a deep sense of the wisdom of Nature. Let us recollect the Socratic method of ratiocination. Do not let us waste our time in overturning systems which present to us plans different from those we see. Let us only deduce consequences from them: to admit them is complete refutation.

I could farther demonstrate, that most islands themselves consist of double parts, as the Continents of which, as I have elsewhere said, they are abridgments from their peaks, their mountains, their lakes, and their rivers proportioned to their extent. Many of those which are situated in the Indian Ocean have, if I may so express myself, two Hemispheres, the one oriental, the other occidental, divided by mountains which go from North to South, so that when it is Winter on one side Summer reigns on the other, and reciprocally; such are the

islands of Java, Sumatra, Borneo, and most of the Philippines and Moluccas; so that they are evidently constructed for the two Monsoons of the Ocean in which they are placed.

Did time permit the varieties of their construction would furnish me with many curious remarks, tending to confirm in particular what I have said in general respecting the consonances of the Globe. For my own part I believe these principles of order to be so certain, that I am persuaded it might be possible, on seeing the plan of an island, with the elevation and the direction of it's mountains, to ascertain it's longitude, it's latitude, and what are the winds which most regularly blow there. Nay, I farther believe, that with these last given, we might, *vice versa*, trace the plan and shape of an island, situated in whatever part of the Ocean. From this however I except fluviatric islands, and such as being too small of themselves are collected into archipelagos, as the Maldivias; because such islands have not the centre of all their adaptations in themselves, but are subordinated to the adjoining rivers, archipelagos, and continents.

It is indubitably certain that I advance no paradox, when I compare between the Tropics the general form of the islands which are exposed to the two Monsoons, and that of the islands which are under the regular East wind. We have just observed, that Nature had given in a certain sense two Hemispheres to the first, in dividing them through the middle by a chain of mountains running North and South, in order that they might receive the alternate influences of the East and West winds, which blow there by turns six months of the year; but in the islands situated in the South-Sea and the Atlantic Ocean, where the East-wind blows incessantly from the same quarter, she has placed the mountains at the extremity of the Land, in the part most remote from the wind, that the brooks and rivers formed from the clouds, which are accumulated by that wind on their peaks, may flow through the whole extent of their isles.

I am sensible that I have elsewhere related these last observations, but I here present them in a new light. Besides, should I sometimes fall into repetition, there can be no great harm in repeating new truths, and some indulgence is due to the weakness of him who announces them.

OF PROGRESSION.

Progression is a series of consonances ascending or descending. Wherever we meet progression, it produces exquisite pleasure, because it excites in our soul the sentiment of infinity so conformable to our nature. I have already said, and it cannot be repeated too frequently: Physical sensations delight us only in so far as they awaken an intellectual and moral sentiment.

When the leaves of a vegetable are arranged round it's branches, in the same order that the branches themselves are round the stem, there is consonancy as in pines; but if the branches of that vegetable are farther disposed among themselves on similar plans, which go on diminishing in magnitude, as in the pyramidical form of firs, there is progression; and if these trees are themselves disposed in long avenues, decreasing in height and in colouring, like their particular mass, our pleasure is heightened, because the progression becomes infinite.

From this instinct of infinity it is that we take pleasure in viewing every object which presents us with a progression; as nursery-grounds containing plants of different ages, hills flying off to the Horizon in successive elevations, perspectives without a termination.

Montesquieu has nevertheless remarked, that if the road from Petersburg to Moscow is in a straight line, the traveller must die upon it with languor. I have performed that journey, and can confidently affirm from personal knowledge, that the road is very far from being in a straight line. But admitting it to be so, the languor of the traveller would arise from the very sentiment of infinity joined to the idea of fatigue. It is this same sentiment, so delicious when it blends with our pleasures, which overwhelms us with anguish unutterable when connected with calamity; as we but too frequently experience. However, I believe that we should sink at length under the weight of an unbounded perspective, from it's presenting infinity to us always in the same manner; for our soul has not only the instinct of it, but likewise that of universality, that is of every possible modification of infinity.

Nature has not formed after our limited manner perspectives with one or two consonances; but she composes them of a multitude of different progressions, by introducing that of plans,

magnitudes, forms, colours, movements, ages, kinds, groups, seasons, latitudes, and combining with these an infinity of consonances, deduced from reflexes of light, of waters, of sounds.

Let me suppose that she had been limited to the plantation of an avenue from Paris to Madrid, with one single genus of trees, say the fig; I do not apprehend I should tire on performing that journey. I should see upon it one species of the fig-tree bearing the fruit called by the Latins *mamillanæ*,* because it had a resemblance to a woman's breast, in Latin *mamilla*: another species with figs quite red and not bigger than an olive, such as those of Mount Ida; another with white fruit; with black; of the colour of porphyry, and thence called by the Ancients *porphyritæ*. In the course of this track would likewise occur the fig-tree of Hyrcania, loaded with more than two hundred bushels of fruit; the ruminal fig-tree, the species under the shade of which *Romulus* and *Remus* were suckled by a she-wolf; the fig-tree of *Hercules*; in a word the nineteen species enumerated by *Pliny*, and a great variety of others unknown to the Romans and to us. Each of these species of trees would exhibit vegetables of various magnitude; young, old, solitary, in clusters; some planted by the brink of rivulets, some issuing from the clefts of rocks. Each tree would present the same variety in it's fruits; exposed on one single foot, if I may use the expression, to different Latitudes, to the South, to the North, to the East, to the West, to the Sun, and under the shade of the leaves: some of them would be green and just beginning to shoot, others violet and cracked, their crevices stored with honey. On the other hand we should find some under different Latitudes, in the same degree of maturity as if they hung upon the same tree, those which grow to the North being in the bottom of valleys, sometimes as forward as those which, though much farther to the South, ripen more slowly from their situation on the tops of mountains.

These progressions are to be found in the minutest of the works of Nature and of which they constitute the principal charm. They are not the effect of any mechanical Law. They have been apportioned to each vegetable, for the purpose of prolonging the enjoyment of it's fruit conformably to the wants of

* See *Pliny's Natural History*, book xv. chap. 18.

Man. Thus the aqueous and cooling fruits, such as those of a ruddy hue, appear only during the season of heat; others, which were necessary in the Winter time, from their nutrimental flours and their oils, as chesnuts and walnuts, are capable of being preserved a considerable part of the year. But those which are designed to supply the accidental demands of Mankind, those of travellers and navigators for instance, remain on the earth at all times. Not only are these last inclosed in shells adapted to their preservation, but they appear upon the tree at all seasons and in every degree of maturity. In tropical countries, on the uninhabited shores of the islands,* the cocoa-tree bears at once twelve or fifteen clusters of cocoa-nuts, some of which are still in the bud; others are in flower; others are knit; others are already full of milk; and finally some are in a state of perfect maturity. The cocoa is the seaman's tree.

It is not the heat of the Tropics which gives to this tree a fecundity so constant and so varied; for the fruit of the trees have, in the Indies as in our climates, seasons of ripening, after which they are seen no more till the season returns. I know of no other, except the cocoa-tree and the banana, which are in fruit all the year round. The last mentioned plant is in my opinion the most useful in the World, because it's fruit makes excellent food without any art of cookery, having a most agreeable flavour and possessing very nutrimental qualities. It produces a cluster or aggregation of sixty or four-score fruit, which come to maturity all at once; but it pushes out shoots of every degree of magnitude which bear in succession and at all times. The progression of fruits in the cocoa is in the tree, and that of the fruits of the banana is in the plantation. Universally that which is most useful is likewise most common.

The productions of our corn-fields and vineyards present dispositions still more wonderful; for though the ear of corn has several faces, it's grains come to maturity at the same time from the mobility of it's straw, which presents them to all the aspects of the Sun. The wind does not grow in form of a bush nor of a tree, but in hedge-rows; and though it's berries be arranged in form of clusters, their transparency renders them throughout penetrable by the rays of the Sun. Nature thus lays men un-

* See *Francis Pyrard's Voyage to the Maldives*

der the necessity, from the spontaneous maturity of these fruits, destined to the general support of human life, to unite their labours, and mutually assist each other in the pleasant toils of the harvest and the vintage. The corn-field and the vineyard may be considered as the most powerful cements of society. *Bacchus* and *Ceres* accordingly were regarded in ancient times as the first Legislators of the Human race. The Poets of antiquity frequently distinguish them by this honourable appellation. An Indian under his banana and his cocoa-tree can do extremely well without his neighbour. It is for this reason, I believe, rather than from the nature of the climate, which is there so mild, that there are so few republics in India and so many governments founded in force. One man can there make an impression on the field of another only by the ravages which he commits: but the European who sees his harvests grow yellow, and his grapes blacken all at once, hastens to summon to his assistance in reaping his crop, not only his neighbours, but the traveller who happens to be passing that way. Besides, Nature, while she has refused to the corn-plant and the vine the power of yielding their fruits at all seasons of the year, has bestowed on the flour of the one, and on the wine of the other, the quality of being preservable for ages.

All the Laws of Nature have a respect to our necessities; not only those which are evidently contrived to minister to our comfort, but others frequently concur to this end, so much the better the more that they seem to deviate from it.

OF CONTRASTS.

Contrasts differ from contraries in this, that contraries act but in one single point, and contrasts in their general combination. An object has but one contrary, but it may have many contrasts. White is the contrary of black; but it contrasts with blue, green, red, and various other colours.

Nature, in order to distinguish the harmonies, the consonances and the progressions of bodies from each other, makes them exhibit contrasts. This Law is so much the less observed the more common it is. We trample under foot truths the most wonderful and of the highest importance, without paying the slightest attention to them.

All Naturalists consider the colour of bodies as simple accidents ; and most of them look on their very forms as the effect of some attraction, incubation, crystallization, &c. Books are every day composed, the object of which is to extend by analogies the mechanical effects of those Laws to the different productions of Nature ; but if they really possess so much power, how comes it that the Sun, that universal agent, has not long ere now filled the waters, the dry land, the forests, the heavens, the plains, and all the creatures over which he exercises so much influence, with the uniform and monotonous effects of his light ? All these objects ought to assume his appearance, and present only white or yellow to our eyes, and be distinguished from each other only by their shades. A landscape ought to exhibit to us no other effects but those of a cameo, or of a print. Latitudes we are told diversify the colour of them. But if Latitudes have this power, how comes it to pass that the productions of the same climate and of the same field have not all the same tints ? Whence is it that the quadrupeds which are born and die in the meadow, do not produce young ones green as the grass on which they are fed ?

Nature has not satisfied herself with establishing particular harmonies in every species of beings in order to characterize them ; but that they might not be confounded among themselves she exhibits them in contrasts. We shall see in the following Study, for what particular reason she has bestowed upon herbs a green hue in preference to every other colour. In general she has made herbs green to detach them from the earth ; and then she has given the colour of the earth to animals which live on herbage to distinguish them in their turn from the ground over which they stray. This general contrast may be remarked in the herbivorous quadrupeds, such as the domestic animals, the yellow beasts of the forests, and in all the granivorous birds which live among herbage, or in the foliage of trees, as the hen, the partridge, the quail, the lark, the sparrow, and many others which are of earthly colours, because they live among verdure. But those, on the contrary, who live on dingy grounds are clad in brilliant colours as the bluish tom-tit and the wood-pecker, which scramble along the rind of trees in pursuit of insects, and many others.

Nature universally opposes the colour of the animal to that of the ground on which it is destined to live. This most admirable Law admits not of a single exception. I shall here produce a few examples of it, to put my Reader in the way of observing those delightful harmonies, of which he will find abundant proofs in every climate. There is seen, on the shores of India, a large and beautiful bird, white and fire-coloured, called the *flamingo*, not that it is of *Flemish* extraction, but the name is derived from the old French word *flambant* (flaming), because it appears at a distance like a flame of fire. He generally inhabits in swampy grounds and salt marshes, in the waters of which he constructs his nest, by raising out of the moisture, of a foot deep, a little hillock of mud a foot and a half high. He makes a hole in the summit of this little hillock; in this the hen deposits two eggs, and hatches them with her feet sunk in the water, by means of the extreme length of her legs. When several of these birds are sitting at the same time on their eggs, in the midst of a swamp, you would take them at a distance for the flames of a conflagration bursting from the bosom of the waters.

Other fowls present contrasts of a different kind on the same shores. The pelican, or wide throat, is a bird white and brown, provided with a large bag under it's beak, which is of excessive length. Out he goes every morning to store his bag with fish: and the supply of the day having been accomplished, he perches on some pointed rock on a level with the water, where he stands immoveable till the evening, says Father *Du Tertre*,* "as in a state of profound sorrow, with the head drooping, from the weight of his long bill, and eyes fixed on the agitated Ocean, as motionless as a statue of marble." On the dusky strand of those Seas may frequently be distinguished herons white as snow, and in azure plains of the sky the paillicu of a silvery white, skimming through it almost out of sight: he is sometimes glazed over with a bright red, having likewise the two long feathers of his tail the colour of fire, as that of the South-Seas.

In many cases, the deeper that the ground is the more brilliant are the colours in which the animal destined to live upon it is arrayed. We have not perhaps in Europe any insect with

* History of the Antilles

richer and gayer clothing than the stercoraceous scarab, and the fly which bears the same epithet. This last is brighter than burnished gold and steel ; the other of a hemispherical form, is of a fine blue, inclining to purple : and in order to render the contrast complete, he exhales a strong and agreeable odour of musk.

Nature seems sometimes to deviate from this Law, but then it is from other reasons of conformity, according to which all her plans are adjusted. Thus, after having contrasted with the ground on which they live, the animals capable of making their escape from every danger by their strength, or their agility, she has confounded those whose slowness or weakness would expose them to the assaults of their enemies. The snail, which is destitute of sight, is of the colour of the bark of the trees which he gnaws, or of the wall in which he takes refuge.

Flat fishes, which are indifferent swimmers, such as the turbot, the flounder, the plaice, the burt, the sole, and several others, which are cut out as it were from a thin plank, because they were destined to a sedentary life close to the bottom of the Sea, are the colour of the sands where they find their nourishment, being spotted like the beach with gray, yellow, black, red, and brown. They are thus speckled, I admit, only on one side, but to such a degree are they possessed of the feeling of this resemblance, that when they find themselves inclosed within the parks formed on the strand to entrap them, and observing the tide gradually retiring, they bury their fins in the sand, expecting the return of the tide, and present to the eye only their deceitful side. It has such a perfect resemblance to the ground on which they squat to conceal themselves, that it would be impossible for the fishermen to distinguish them from it, without the help of sickles, with which they trace small fosses in every direction along the surface of the sand, to detect by the touch what the eye could not discern. Of this I have been a witness oftener than once, much more highly amused at the dexterity displayed by the fishes than at that of the fishermen.

The thornback, on the contrary, which is also a flat fish and a bad swimmer, but carnivorous, is marbled with white and brown, in order to be perceived at a distance by other fishes ; and to prevent their being devoured in their turn by their enemies, which are very alert, such as the sea-dog, or by their own companions, for they are extremely voracious, Nature has clad

them in a prickly mail, particularly on the posterior part of the body, as the tail, which is most exposed to attack when they fly.

Nature has bestowed at once, in the colours of innoxious animals, contrasts with the ground on which they live, and consonances with that which is adjacent, and has superadded the instinct of employing these alternately, according as good or bad fortune prompts. These wonderful accommodations may be remarked in most of our small birds, whose flight is feeble and of short duration. The gray lark finds her subsistence among the grass of the plains. Does any thing terrify her? she glides away and takes her station between two little clods of earth, where she becomes invisible. On this post she remains in such perfect tranquillity, as hardly to quit it when the foot of the fowler is ready to crush her.

The same thing is true of the partridge. I have no doubt that these defenceless birds have a sense of those contrasts and correspondencies of colour, for I have remarked it even in insects. In the month of March last I observed, by the brink of the rivulet which washes the Gobelins,* a butterfly of the colour of brick, reposing with expanded wings on a tuft of grass. On my approaching him he flew off. He alighted at some paces distance on the ground, which at that place was of the same colour with himself. I approached him a second time; he took a second flight, and perched again on a similar stripe of earth. In a word, I found it was not in my power to oblige him to alight on the grass, though I made frequent attempts to that effect, and though the spaces of earth which separated the turfy soil were narrow and few in number.

This wonderful instinct is likewise conspicuously evident in the camelcon. This species of lizard, whose motion is extremely slow, is indemnified for this by the incomprehensible faculty of assuming at pleasure the colour of the ground over which he moves. With this advantage he is enabled to elude the eye of his pursuer, whose speed would soon have overtaken him. This faculty is in his will, for his skin is by no means a mirror. It reflects only the colour of objects, and not their form. What is farther singularly remarkable in this, and perfectly ascertained

* A small village in the suburbs of Paris, noted for its manufactures in fine tapestry and superb mirrors —H II

by Naturalists, though they assign no reason for it, he can assume all colours, as brown, gray, yellow, and especially green, but never red. Theameleon has been placed for weeks together amidst scarlet stuffs, without acquiring the slightest shade of that colour. Nature seems to have with-held from the creature this shining hue, because it could serve only to render him perceptible at a greater distance; and farther, because this colour is that of the ground of no species of earth or of vegetable on which he is designed to pass his life.

But in the age of weakness and inexperience, Nature confounds the colour of the harmless animals with that of the ground on which they inhabit, without committing to them the power of choice. The young of pigeons, and of most granivorous fowls, are clothed with a greenish shaggy coat, resembling the mosses of their nests. Caterpillars are blind, and have the complexion of the foliage and of the barks which they devour. Nay the young fruits, before they come to be armed with prickles, or inclosed in cases, in bitter pulps, in hard shells, to protect their seeds, are during the season of their expansion green as the leaves which surround them. Some embryos it is true, such as those of certain pears, are ruddy and brown; but they are then of the colour of the bark of the tree to which they belong. When those fruits have inclosed their seeds in kernels or nuts, so as to be in no farther danger, they then change colour. They become yellow, blue, gold-coloured, red, black, and give to their respective trees their natural contrasts. It is strikingly remarkable, that every fruit which has changed colour has seed in a state of maturity.

The insects in like manner having deposited their robes of infancy, and now committed to their own experience, spread abroad over the world to multiply the harmonies of it, with the attire and the instincts which Nature has conferred upon them. Then it is that clouds of butterflies, which in their caterpillar state were confounded with the verdure of plants, now oppose the colours and the forms of their wings to those of the flowers; the red to the blue, the white to the red, the *antennæ* to the *stamina*, and fringes to the *corollæ*. I was one day struck with admiration at one of these, whose wings were azure, and besprinkled with specks of the colour of aurora, as he reposed in the bosom of a full-blown rose. He seemed to be disputing

beauty with the flower. It would have been difficult to determine which way to adjudge the prize, in favour of the butterfly or of the rose ; but on seeing the flower crowned with wings of *lapis lazuli*, and the azure insect deposited in a goblet of carmine, it was obvious on the slightest glance, that their charming contrast greatly enhanced their mutual beauty.

Nature does not employ those agreeable correspondencies and contrasts in the decoration of noxious animals, nor even of dangerous vegetables. Of whatever kind the carnivorous or venomous animals may be, they form at every age, and wherever they are, oppositions harsh and disgusting. The white bear of the North announces his approach over the snow by a hollow noise, by the blackness of his snout and paws, and by a throat and eyes the colour of blood. The ferocious beasts which hunt for their prey in the gloom of darkness, or in the solitude of the forests, give notice of their presence by loud roarings, lamentable cries, eyes inflamed, urinous or fetid smells. The crocodile, in ambush among the flags upon the shores of the rivers in Asia, where he assumes the appearance of the trunk of a tree turned upside down, betrays himself from afar by strong exhalations of the smell of musk. The rattlesnake, concealed in the grassy swamps of America, cannot stir without sounding his ominous alarm.* The very insects which make war on others are clad in sable attire, in which colours are harshly opposed, and in which black particularly predominates, and clashes disagreeably with white or yellow. The humble-bee, independently of his buzzing noise, announces himself by the blackness of his breast-plate and his large belly bristled over with yellow hairs. He appears amidst the flowers like a burning coal half extinguished. The carnivorous wasp is yellow, and striped with black like the tiger. But the useful bee is of the complexion of the *stamina* and of the *calices* of the flowers among which she reaps her innocent harvest.

* This is not correct. The rattle-snake can, and often does, move to considerable distances, without sounding his bells. It is more true, that he does not strike to inflict a wound, "without sounding his ominous alarm," but neither is this *entirely* true. There is a small species of rattle-snake, not well known to the Naturalists, which chiefly inhabits the wet, grassy ground : but the common and large rattle-snake more generally affects the drier ground.—B. S. B.

Poisonous, plants present, like noxious animals, disgusting contrasts, from the livid colours of their flowers, in which black deep blue and a smoky violet are in harsh opposition with the tender shades; from their nauseous and virulent smells; from their prickly foliage, of a dark green hue, and clashing with white on the under-side: such are the aconite tribes. I am acquainted with no plant of an aspect so hideous as those of this family, and among others, that which the French denonimate *napel*,* the most venomous vegetable of our climates. I shall not take upon me to determine whether the embryos of their fruits do not disclose, from the very first moments of their expansion, harsh oppositions, which give warning of their malesic characters: if it be so, they have this farther resemblance in common to them with the young of ferocious animals.

Such of the brute creation as are intended to live on two different grounds are impressed with a double contrast in their colours. Thus, for example, the king-fisher, which skims along rivers, is at once musk-coloured and glazed over with azure; so as to be detached from the dusky shores by his azure colour, and from the azure of the waters by his musk-colour. The duck, which dabbles on the same shores, has the body tinged of an ash-colour, while the head and neck are of an emerald-green; so that he is perfectly distinguishable by the gray colour of his body from the verdure of the aquatic plants among which he waddles, and by the verdure of his head and neck from the dark coloured mud where he finds part of his food, and in which, by another most astonishing contrast, he never soils his plumage.

The same contrasts of colour are observable in the wood-pecker, who lives on the trunks of trees, along which he scrambles in quest of the insects that are lodged under their rind. This bird is at once green-coloured and brown; so that though he lives, properly speaking, in the shade, he is always percep-

* There is, no doubt, something lurid, or forbidding, in the aspect of many of the poisonous plants. But I am persuaded, that many of these plants give no indication, whatever, of their deleterious quality: such, not to mention others, the beautiful *digitalis*, or fox-glove: and, on the other hand, there are some innocent plants, whose physiognomy would lead us to believe, that they are deleterious. In the eye of the mere *botanist*, the parsley or the celery are as likely to prove deleterious as the *æthusa* or the *conium*—B. S. B.

tible however on the trunk of the trees ; for he detaches himself from their dusky rind by means of that part of his plumage which is of a brilliant green, and from the verdure of their mosses and lichens by those of his feathers which are brown.

Nature opposes then the colours of every animal to those of the respective ground on which it is to be placed ; and what confirms the truth of this Law is, that the greatest part of birds which live on one ground only have but a single colour, and that one strongly contrasted with the colour of the ground. Accordingly the birds which live aloft in the air on the azury ground of the Heavens, or on the bosom of the waters in the midst of lakes, are mostly white, which of all colours forms the most striking contrast with blue, and is consequently most adapted to render them perceptible at a distance. Such are between the Tropics, the pailençu, a bird of a glossy white, whose flight is through the superior regions of the air, the heron, the gull, the sea-mew, which skim along the surface of the azure deep, and the swan, fleets of which navigate the extensive lakes of the North.

There are likewise others which, in order to form a contrast with those that I have last mentioned, detach themselves from the skies and from the waters by their black or dusky colours : such are, for example, the crow in our own climates, which is perceptible at so great a distance in the Heavens on the white ground of the clouds ; many sea-fowls of a brown and blackish colour, as the frigate of the Tropics, which plays through the air amidst storm and tempest ; the mower, or sea-cutter, a water-bird, which grazes with his dark-coloured wings, shaped like a scythe, the white surface of the foamy billows of the Ocean.

From these examples therefore it may be inferred, that when an animal is invested with but one single tint he is intended but for one situation ; and when he combines in himself the contrast of two opposite tints, that he lives on two grounds, the colours themselves of which are determined by that of the plumage or of the hair of the animal. We must be upon our guard at the same time against an unlimited generalization of this Law. We ought to consider it as harmonizing with the exceptions which wise Nature has introduced and established for the very preservation of animals ; such as, in general, the

whitening of them to the North in the Winter season, and on lofty mountains, as a remedy against excess of cold, by arraying them in a colour which reflects the most heat ; and embrowning them to the South, during the ardors of Summer and on sandy districts, and thereby sheltering them from the effects of burning heat by the intervention of absorbent colours. What evidently demonstrates that these great effects of harmony are not mechanical results of the influence of the bodies which surround animals, or of the apprehensions of the mother on the tender organs of the fœtus, or of the action of the rays of the Sun on their plumage, according to the explications hitherto attempted by our systems of physic ; what evidently demonstrates this, I say, is, that among the almost infinite number of birds which pass their life in the higher regions of the air, or on the surface of the Seas, whose colours are azure, there is not a single bird of the colour of blue ; and that on the contrary, many birds which live between the Tropics, in the bosom of black rocks, or under the shade of sullen forests, are azure coloured : such are the Batavia hen, which is blue all over ; the Dutch pigeon of the Isle of France, and many others.

Another consequence equally important may be deduced from these observations ; it is this, that all these harmonies are contrived for the use of Man. A blue-coloured fowl on the azure ground of the sky, or on the surface of the waters, would elude our sight. Nature besides has reserved the rich and agreeable colours only for the birds which live in our vicinity. This is so indubitably certain, that though the Sun acts between the Tropics with the whole energy of his rays on the fowls whose residence is the wide Ocean, there is not a single one of them arrayed in a beautifully coloured plumage, whereas those which inhabit the shores of the Seas and of the rivers are frequently dressed in the most gorgeous attire. The flamingo, a tall bird which lives in the swampy shores of the South-Seas, has a white plumage charged with carmine. The toucan on the same strands has an enormous bill of the most lively red ; and when he retires from the bosom of the humid sands where he finds his food, you would be tempted to say that he has just fished out of them a stump of coral. There is another species of toucan whose beak is white and black, as finely polished as if it consisted of ebon and ivory. The pintada with speckled plumage, the pea-

cock, the duck, the king-fisher, and a multitude of other river-birds, embellish by the enamel of their colours the banks of the Asiatic and African streams. But we find nothing once to be compared with them in the plumage of such as inhabit the open Sea, though they are still more exposed to the influences of the Sun.

As a farther consequence of these correspondencies with Man, Nature has given to the birds which live remote from him, cries shrill, hoarse, and piercing, but which are as proper as their ill assorted colours to render them perceptible at a distance amidst their wild retreats. She has bestowed on the contrary sweet notes and melodious voices on the little birds which people our groves and domesticate themselves in our habitations, in order to heighten our delight, as well by the music of their warbling as by the beauty of their colours. We repeat it, in order to confirm the truth of the principles of the harmonies which we are laying down : Nature has established an order of beauty so real in the plumage and song of birds, that she has endowed with these such birds only whose life was in some sort innocent relatively to Man, as those which are granivorous or which live on insects ; and she has denied those advantages to birds of prey and to most sea-fowls, which in general have earthly colours and disagreeable cries.

All the kingdoms of Nature present themselves to Man with the same correspondencies, the abysses of the Ocean themselves not excepted. The fishes which live on animal substances, as the whole class of the cartilaginous do, such as the seal, the sea-dog, the shark, the slipper, the thornback, the polypus, and many others, have disgusting forms and colours.* Fishes which live in the open sea have colours marbled with white, black, brown, which distinguish them in the bosom of the azure billows, such are whales, blowers, porpoises, and others. But it is among those which frequent the dusky shores, and particularly in the num-

* The seal is improperly enumerated among the class of fishes. It is one of the viviparous animals of the class of *mammalia*, as are also the whole of the whales, including the porpoise, the grampus, the dolphin, and many others. St. Pierre is more correct in mentioning the shark, the thornback (*raja*) as fishes. These are, indeed, fishes, though Linnæus and others have arranged them with the *amphibia*. The polypus is an animal of a very different and remote class, that to which Linnæus gave the name of *vermes*. A fish it cannot be.—B. S. B.

ber of such as are denominated *saxatile*, because they live among the rocks, that we find the fishes, the lustre of whose skin and scales far surpasses all the efforts of the pencil, especially when they are alive. It is thus that legions of mackarel and herrings diffuse the radiance of silver and azure over the northern strands of Europe.

It is around the black rocks which bound the Seas of the Tropics, that the fish known by the name of *captain* is caught. Though his colours vary with the latitude, it is sufficient, in order to convey an idea of his beauty, to detail the description given of it by *Francis Cauche*,* in a species caught on the coasts of Madagascar. He says that this fish, which takes pleasure in the rocks, is streaked in the form of lozenges ; that his scales are of a pale gold-colour, and that his back is coloured and glazed over with laca, inclining in several places toward vermillion. His dorsal fin and tail are waved with azure, fading away into green toward the extremities.

About the bottom of the same rocks is likewise found the magnificent fish called the *sardin*, and by the Brazilians *acapinima* of which *Margrave* has given the figure in his fourth Book, Chap 6. This beautiful fish is adorned with scales of at once a gold and silver hue, crossed from head to tail by black lines which admirably heighten their lustre. The same Author describes a variety of species of moon fish besides, which frequent the same places.

For my own part, I have amused myself on the rocks of the Island of Ascension, in observing for hours together the moon-fish sporting amidst the tumultuous waves which are incessantly breaking upon them. These fishes, of which there are various species, have the rounded and sometimes sloping form of the orb of night whose name they bear. They are besides, like her, of the colour of polished silver. They seem destined to elude the sagacity of the fisherman in every possible way ; for they have their belly streaked with black cross-stripes of a lozenge form which gives them all the appearance of being caught in a net ; they seem every instant on the point of being tossed on shore by the agitation of the billows in which they play ; farther, their mouth is so small that they frequently nibble away the bait without touching the hook ; and their skin without scales, like that

* Consult *Francis Cauche*, his relation of Madagascar.

of the seal, is so hard, that the harpoon often misses it's blow be the prongs ever so keenly whetted. *Francis Couche* likewise says, that it requires a very violent exertion to make an incision into their skin with the sharpest knife.

It is on the same shores of Ascension-island that we find the *murena*, a species of lamprey, or eel of the rocks, which is excellent food, and whose skin is besprinkled with gilded flowers. It may be affirmed in general, that every rock in the sea is frequented by a multitude of fishes of the most brilliant colours; such as the gilt head, the perroquet, the zebra, the roach, and others without number, the very classes of which are unknown to us. The more that the rocks and shallows of any sea are multiplied, the more varied likewise are the species of the saxatile fishes which resort thither. For this reason it is that the Maldivia Islands, which are so numerous, furnish themselves alone a prodigious multitude of fishes of very different colours and forms, with the greatest part of which our Ichthyologists are hitherto totally unacquainted.

As often therefore as you see a brilliant fish, you may be assured that his habitation is near the shore, and that, on the contrary, he lives in the open Ocean if he is of a dark colour. The truth of this may be ascertained by ourselves in the channels and on the banks of our own rivers. The silver smelt and the blay, whose scales are employed in the formation of mock pearls, play on the strand of the Seine; whereas the eel, of the gloomy colour of slate, takes pleasure to dabble in the midst and at the bottom of the stream. We must not however pretend to generalize these Laws to the exclusion of all exceptions. Nature, as has been said, subjects all to the mutual adaptation of beings and to the enjoyment of Man. Thus, for example, though the fishes on the shores have in general shining colours, there are however several species of them invariably of a dark colour. Such are not only those which swim indifferently, as soles, turbot, &c. but those also which inhabit some parts of the shores whose colours are lively. Thus the tortoise, which pastures at the bottom of the sea on green herbs, or which crawls by night over the white sands there to deposit her eggs, is of a shady colour; thus the lamentine, which enters into the channel of the rivers of America in quest of food, in the verdure of their banks

without leaving the water, detaches himself from that verdure by the brown colour of his skin.

The saxatile fishes, which can easily insure their safety among the rocks by agility in swimming, or by the facility of finding a retreat in their cavernous receptacles, or of there defending themselves against their enemies by the armour which Nature has bestowed, have all of them lively and shining colours, the cartilaginous excepted: such are the blood-coloured crabs, the azure and purple lobsters, called *langouste* and *homard*, and among others that to which *Rondelet* has given the name of *Thetis*, on account of it's beauty, the violet-coloured urchins armed with points and spears, the nerits, inclosed in a spiral case, with rose and gray coloured ribbons winding round it, and an endless variety of others.

It is very remarkable that all shell fish which walk and migrate, and consequently have the power of choosing their asylum are those in their kind which have the richest colours: such are the nerits which I have just mentioned, the purple fish, or Venus shell, resembling polished marble, the olives, shaded like velvet of three or four colours, the harp, embellished with the tints of the most beautiful tulips, the tunny, speckled like the partridges wing, which walks along under the shade of the madrépores; and all the families of the univalves, which force their way into the sand for shelter, the bivalves, as the ducal-cloak, scarlet coloured and orange, and a multitude of other migrating shell-fish are impressed with colours the most lively, and form with the different grounds of the Sea, secondary harmonies totally unknown.

But those which do not change their situation, as most of the oysters of the seas to the southward, which frequently adhere to the rocks, or those which are perpetually at anchor in straits, as muscles and the *pinna-marina*, attached to pebbles by threads, or those which rest on the bosom of the madrépores, like vessels on the stocks, as the Noah's ark, or those which are entirely buried in the heart of calcareous rocks, as the dail of the Mediterranean, or such as are immovable from their weight, which sometimes exceeds that of several quintals, and pave the surface of flats, as the thuilée of the Moluccas, and the large bivalves, as the rocks, the burgos, &c. or those, in a word, which I believe are blind, like our land-snails, such as lempits, which fasten

themselves by the formation of a vacuum on the shining surface of the rocks, are of the colour of the ground which they inhabit, in order to be less perceptible to their enemies.

It is rather very highly worthy of observation, that though many of those sedentary shell-fish are clothed in a brown and shaggy outward garment, as those which are called cornets and rollers; or with a black pellicle of the shade of the pebbles to which they are attached, as the Magellan-muscles; or encompassed with a mud-coloured tartar, as the lempit and the burgo: they have, under their gloomy upper-coats, pearly appearances and tints, the beauty of which frequently exceed those of the shell-fish whose apparent colours are the most brilliant. Thus the Magellan-lempit, cleansed of its tartar by means of vinegar, presents the richest of cups, shaded with the colours of the finest tortoise-shell, and blended with a burnished gold, which is perceptible through a chesnut-coloured varnish. The large muscle of Magellan's strait conceals in like manner, under its black coat, the oriental shades of the aurora.

It is impossible to ascribe, as in the shell-fish of India, colours so charming to the action of the Sun on these shells, covered as they are with tartars and rough coats, and which are the clothing of fish that live beside in a foggy climate, abandoned for a great part of the year to gloomy Winters and long tempests. We may venture to affirm that Nature has veiled their beauty only to preserve it for the enjoyment of Man, and has placed them only on the verge of the shores, where the Sea purifies them by tossing them about, to put them within his reach. Thus, by a most wonderful contrast, she places the most brilliant shells in regions the most exposed to the ravages of the elements; and by another contrast, no less astonishing, she presents to the poor Patagonians spoons and cups, the lustre of which far surpasses beyond all contradiction the richest plate of polished Nations.

Hence it may be inferred that fishes in general, and shell-fish in particular, which have two opposite colours, live on two different grounds, as we have observed in the case of birds, and that those which have only one colour frequent only one ground. I recollect that on making the tour of the Isle of France on foot, along the shore of the Sea, I found upon it nerits with an ash-gray ground encircled with red ribbons, sometimes on the dusky

rocks, sometimes on the white madrépores, with their peach-coloured flowers. They contrasted in the most agreeable manner, and appeared at the bottom on the sea-plants like fruit growing upon them. I likewise found there the Venus-shell completely white, with a rose coloured mouth, swelled backward like eggs, from which too they sometimes borrow their name. But it is now impossible for me to affirm with certainty, whether they adhered to the dark coloured rocks or to the white madrépores.

There are likewise to be found on the coasts of Normandy, in the district of Caux, two sorts of rocks, the one of white marl detached from the cliffs, the other formed of black bisets, which are amalgamated with the craggy cliff. Now I never saw there, in general, but two sorts of periwinkles, called by the country people *vignots*; the one very common and used as food, which is quite black, and the other white, with a faint-red mouth. I presume not at this distance to aver, whether the white periwinkles attach themselves to the white rocks, and the black periwinkles to the black rocks, or contrariwise, for I did not make the observation. But whether they form with those rocks consonances or contrasts, it is very singular that, as there are but two species of rocks, so there should be but two species of periwinkles. I am inclined to believe, that the black periwinkle adheres in preference to the black rock; for I have observed in the Isle of France that there is neither black-coloured periwinkle nor muscle, because there is in those seas no pebble or rock precisely of that colour; and I am perfectly certain, that muscles are always of the colour of the ground on which they live: those of the Isle of France are brown.

It must not be concluded, on the other hand, that such shell-fish are indebted for their colours to the rocks on which they adhere by suction; for it would thence follow, that the rocks of Magellan's strait, which produce muscles and lempits so rich in colouring, should be themselves inlaid with mother-of-pearl, opal, and amethyst; besides, every rock maintains shell-fish of very different colours. You find at the bottom of the rocks on the coast of the district of Caux, which are loaded with black periwinkles, the azure-coloured lobster, the crab marbled with red and brown, legions of muscles of a deep blue, with lempits of an ash-gray. All these fishes when alive form harmonies the

most agreeable with a multitude of marine plants, which fringe those black and white rocks with their tints of purple, gray, rust-coloured, brown, and green; and with the variety of their forms and aggregations, like oaken boughs, tufts of different shapes, garlands, festoons, and long cordage, agitated by the waves in every possible manner. In truth there is no Painter capable of composing similar groups, let him give what scope he pleases to his imagination. Many of those marine harmonies have escaped me, for I then considered them as merely the effect of chance. I looked at them, I admired them, but I observed them not: I suspected however, even then, that the pleasure which their harmonic combinations inspired must be referable to some Law with which I am unacquainted.

Enough has been said to demonstrate how much Naturalists have mutilated the finest portion of Natural History, by retailing as they for the most part do, isolated descriptions of animals and of plants, without saying a word of the season when and of the place where they are to be found. By this negligence they strip them of all their beauty; for there is not an animal nor a plant existing, whose harmonic point is not fixed to a certain situation, to a certain hour of the day or of the night, to the rising or the setting of the Sun, to the phases of the Moon, nay to the very tempests; to say nothing of the other contrasts and correspondencies which result from these.*

I am so thoroughly persuaded of the existence of all those harmonies, that I entertain not the slightest doubt that, on seeing the colour of an animal, one might be able to determine nearly that of the ground which it inhabits; and that by following up those indications, a road might be paved to very curious discoveries. For example, we have not hitherto found on any shore the *cornu d'ammon*, that fossil so common, and of a size so considerable, in our quarries. I think we ought to look for that brown coloured shell-fish in grassy marine places, such as those in which the sea-tortoise pastures. I do not know that any one has hitherto thought of dragging those bottoms, because

* There is certainly *some* foundation for this censure of the Naturalists. But the censure is too broad and severe. It is not in *many* of the later books of Natural History, that we find descriptions of animals and of vegetables, without being at the same time told what countries and what situations they inhabit.—R S B

of the abundance of sea-plants which grow upon them, and because they are frequently of a great depth, and at a great distance from the coasts, such as those which surround the Cape-de-Verd islands, or, according to others, toward Florida, and which at certain seasons set their herbage a-floating in such quantities, that the Sea is covered with it for the space of thirty or forty leagues, and ships can with difficulty force their way through it. If the most brilliant shells are to be found on dark grounds, dusky shells ought to be found on green grounds.

We meet with those contrasts even in the brute soils of the earth, as I could evince to demonstration, did time permit. The following simple strain of reasoning is sufficient to ascertain the truth of this. If an uniform and mechanical cause had produced the Globe of the Earth, it must have been universally of the same matter, and of the same colour: the hills, the mountains, the rocks, the sands, must have been amalgams, or the rubbish of each other; but this is not found to be the case in any one district of however small extent. In general, as has been said, the soil is white to the North, and dark-coloured to the South, in order to reflect the heat in the first case, and to absorb it in the second; but notwithstanding these general dispositions, you find in every place, in particular, the most wonderful variety. In the same canton may be found red mountains, black rocks, white plains, and yellow sands. Their substance is as much varied as their colour; there are granites, calcareous stones, gypses or plasters, and vitrifiable sands.

In the Isle of France, the rocks of the mountains are blackish, the earth in the valleys is red, and the sands on the shore are white. The rocks there are vitrifiable, and the sands calcareous. When I was in that island, a private adventurer having formed the plan of a glass manufactory, the process turned out the directly contrary of what he had proposed; for, upon lighting up his furnace with great formality and pomp, the sand of which he expected to make glass changed into chalk, and the stones of his furnace became vitrified. Though it be a rare thing to see white earths between the Tropics, white sands are however common there upon the shores. It is certain that this colour, from it's lustre and it's refraction to the Horizon, renders low lands perceptible at a very great distance, as has been well remarked by *John-Hugo de Linschoten*, who, but for those

sentinels planted by Nature on most of the gloomy and low coasts of India, must there have several times made shipwreck. On the coasts of the Pais de Caux the sands are gray, but the cliffs are white ; together with this they are divided into black and horizontal stripes of pebbles, which form contrasts very perceptible at a great distance.

There are places where we find white rocks and red lands, as in quarries of mill-stone ; from these result very agreeable effects, especially in connection with their natural accessories of vegetables and of animals. I should digress too far, were I to enter into any detail on this subject. It is sufficient for me at present to recommend to Naturalists to study Nature, as the great Painters do ; that is, by uniting the harmonies of the three kingdoms. Every one who shall observe in this manner will find a new light diffused over the perusal of Voyages and of Natural History, though their Authors scarcely ever speak of those contrasts, except by chance, and without expressing any doubt about the matter. But every man will be himself in a condition to discover their delightful effects in what is called brute Nature, I mean that with which Man has not intermeddled. Let me suggest the infallible means of distinguishing them : it is simply this, as often as a natural object presents to you a sentiment of pleasure, you may rest assured that it exhibits some harmonic concert.

Beyond all doubt animals and plants of the same climate have not received from the Sun nor from the elements liveries so varied and so characteristic. A thousand and a thousand new observations may be made upon their contrasts. He who has not seen them in their natural place has not yet become acquainted with their beauty or their deformity. Not only are they in opposition to the grounds of their respective habitations, but they are so likewise between themselves as to genus and genus ; and it is worthy of remark that when these contrasts are established they exist in all the parts of the two individuals. We shall speak somewhat of those plants in the following Study, by simply glancing at that delightful and inexhaustible subject.

Those of animals are still farther extended ; they are opposed not only in forms and in gestures, but in instincts ; and with differences so decidedly marked, they love to associate with each other in the same places. It is this consonance of tastes which

distinguishes, as I have said, beings which are in contrast, from those which are contrary or enemies. Thus the bee and the butterfly extract the nectar of the same flowers ; and the single-hoofed horse snuffing up the wind, with his mane flowing over his graceful neck, delights to amble about airily over the same meadows on which the ponderous bull impresses his cloven foot ; the dull and steady ass takes pleasure in scrambling over the rocks where the capricious goat frisks and bounds ; the cat and the dog live peaceably by the same fire-side, unless where the tyranny of Man has vitiated their dispositions by a treatment calculated to excite hatreds and jealousies between them.

Finally contrasts exist not only in the Works of Nature in general, but in each individual in particular, and constitute as well as consonances the organization of bodies. If you examine one of those bodies, of whatever species it may be, you will remark in it forms absolutely opposite, and nevertheless consonant. It is thus that in animals the excretory organs contrast with those of nutrition. The long tails of horses and bulls are opposed to the large size of their heads and of their necks, and come in as a supplement to the motions of these anterior parts, which are too unwieldy to drive away the insects that infest them. On the contrary the broad tail of the peacock forms a contrast with the length of the neck, and the smallness of the head of that magnificent bird. The proportions of other animals present oppositions which are no less harmonic, nor less happily adapted to the necessities of each species.*

* This Law of contrasts is, if I am not mistaken, a delicious source of observation and discovery. The women, I repeat it, always nearer to Nature than we are, employ it continually in the assortment of the colours which they use in dress, whereas no Naturalist, as far as I know, has ever observed that Nature herself acts in conformity to it in the harmony of all her Works. Any one may find a demonstration of this without stirring beyond his own house. For example, though there be among dogs a singular variety of colours, never was any one seen red, green, or blue : but they are for the most part of two opposite tints, the one clear and the other dark, in order that in whatever part of the house they are, they may be perceptible on the furniture, with the colour of which they would frequently be confounded.

But though the colours of these animals be taken, as well as those of most quadrupeds, from the two extreme terms of the progression of colours, that is black and white, I do not recollect that I ever saw a dog completely white, or completely black. White dogs always have some spots on their skins, were it but the tip of the snout of a dark colour. Such as are black or brown

Harmonies, consonances, progressions, and contrasts, must therefore be reckoned among the first elements of Nature. To these we are indebted for the sentiments of order, of beauty, of pleasure, which spring up in the mind at the sight of her Works; and from her absence arise the uneasy feelings of disorder, ug-

have streaks of white or fire-coloured specks; so that wherever they are you can easily perceive them. I have farther remarked in them this instinct, especially in dogs of a dusky colour; when they want to lie down they always resort to a white-coloured ground in preference to one of any other colour. The Ladies well know this to be the case; for if there happens to be a little dog of a dark hue in an apartment where company is assembled, he hardly ever fails to go to repose at a Lady's foot and on her petticoats.

The instinct which prompts the dog to retire to rest on white stuffs, arises from the feeling which he himself has of the contrast affected by the fleas by which he is frequently tormented. Fleas in whatever place resort to white-coloured objects. If you enter into a room where there are many of those insects, if you happen to have white stockings, these will instantly attract them. They will even croud to a single sheet of white paper. And this is the reason why light-coloured dogs are much more infested by them than others. I have likewise observed that wherever there are dogs of a white colour, the black and the brown pay court to them and give them a decided preference as play-mates, undoubtedly to get rid of the fleas at their expense. In saying this, however, I do not mean to throw an imputation of treachery on their profession of friendship. Were it not for the instinct of these minute, black, nimble, nocturnal insects toward the white colour, it would be impossible to perceive and catch them.

The common deep-coloured fly resorts in like manner to white and brilliant objects; and this accounts for the tarnishing of every thing glossy or gilded in our apartments. The flesh-fly delights on the contrary to settle on the livid colours of meat in a state of putridity. His blue corselet makes him easily discernible on that ground.

If we extend these contrasts farther, we shall find that not only all sanguivorous insects have the instinct of opposing their colours to those of the situations in which they live, but all carnivorous animals, likewise; whereas all feeble, gentle, and innoxious animals, as we have seen, are furnished with means and instincts of consonance with the ground on which they are made to inhabit. Thus has Nature willed it should be, in order that the first might be perceived by their enemies, and that the second might be enabled to escape them.

From those natural Laws might be deduced a multitude of useful and agreeable consequences, tending to the improvement of our habitations in respect of cleanliness and conveniency. For example, in order the more readily to destroy the insects which disturb our sleep, and which are so common in Paris, it would be proper to have the alcoves, the staining, the drapery, the wooden frames of our beds of white or faint colours; on which insects might be easily perceived.

As to conveniency, every one must be sensible how necessary it is that the colours of different pieces of furniture should form a contrast for the purpose

liness, languor, and disgust. They extend equally to all the kingdoms ; and though I have limited myself, in the sequel of this Work, to an examination of their effects in the vegetable kingdom only, it is impossible for me however to deny myself the pleasure of indicating them, at least in the human figure. It is here that Nature has combined all the harmonic expressions in their highest degree of excellency. All I can do is to trace a feeble sketch of it. To acknowledge the truth, this is not precisely the proper place, neither have I leisure to arrange more than a part of the observations which I have collected on this vast and interesting subject. But the little which I am going to advance will be sufficient to overturn the position maintained by men of but too high celebrity in the World of Science, namely, That human beauty is arbitrary.

I will even go so far as to flatter myself with the hope that these rude Essays may induce wise men who love Nature, and who wish to be acquainted with her Laws, to dig into the recesses of this vast mountain of hidden treasure, in which Truth lies buried. Their multiplied illumination will conduct them without difficulty through the whole extent of that invaluable mine, of which, groping like a blind man, I have traced only the first superficial furrows. They will be led on from one rich vein of precious ore to another still richer, since even I, if I may presume to say so, have been able at the bottom of a valley, and on the sandy bed of a little rivulet, to pick up a few straggling grains of gold.

of being distinguished with facility. I am frequently at a loss, for instance, to know what is become of my snuff-box, because it is black like the table on which I put it down. If Nature had not been possessed of more intelligence than I am the greatest part of her Works would utterly disappear. It is very astonishing that Philosophers who have pursued so many curious researches respecting the nature of colours, should never have suggested a syllable respecting their contrasts, without which nothing would be distinguishable ; or rather their forgetfulness is not surprising : Man is incessantly pursuing the illusion which escapes him, and neglects the useful truth which is lying at his foot.

The harmonies of colours have besides a mighty influence upon the passions : but I must not presume to say any thing with regard to this in the Country where the Women employ them with such unbounded sway. To the Women I stand indebted for the first idea I had of studying the elements of the Laws by which Nature herself strives to communicate pleasure to us.

For the following Note, which came too late for insertion in a more proper place, I am indebted to my ingenious friend, Professor Patterson, of the University of Pennsylvania:

1. If the polar ices be supposed to float in the surrounding waters of the Sea, then, neither during the time of freezing in Winter, nor that of thawing in Summer, so far as respects the sea-water alone, will any current at all be produced. For, from a well known principle in hydrostatics, any solid body floating in water, (or any other fluid) will displace exactly it's own weight of that fluid. It follows, then, that any body of floating ice, however great, will, when dissolved, do no more than fill up the space in the water it had previously occupied.

2. If we suppose the polar ices to be attached to, or resting on the bottom of the Sea, then, as ice is of less specific gravity than water, it will occupy more space than the water from which it was produced; consequently during the time of freezing, the ice formed under water, (and, by being attached to the polar nucleus, not suffered to emerge,) would actually tend to produce a current *from* the Poles; and during the time of thawing, a current *towards* the Poles—directly contrary to the hypothesis!

3. The rain, snow, hail, or vapours, which, during the winter, may fall on the polar ice, and there accumulate, will, if the ice float, sink it deeper into the water, and thereby tend to produce a current *from* the Pole—contrary also to the hypothesis. If the ice be attached to, or rest on the bottom, then this accumulation from the atmosphere will produce no current either way; and tho' in the Summer, during the thaw, a current, from this cause, would be produced; yet this will be counteracted, and perhaps completely counterbalanced, by the thawing of the ice under the surface of the water. Thus it appears, that the polar ices are not only inadequate to the production of the tides, but that they have in reality no agency whatever in this matter.

As a corroboration of this opinion, it may be observed, that Captain *Cook*, in the account he gives of his sailing round the South Pole, along the shore of polar ice, in the middle of Summer, while the fusion of the ice must have been going on with the greatest rapidity, says nothing of any current setting outwards; which, however, upon the hypothesis of our Author, must then have been very considerable.—B. S. B.



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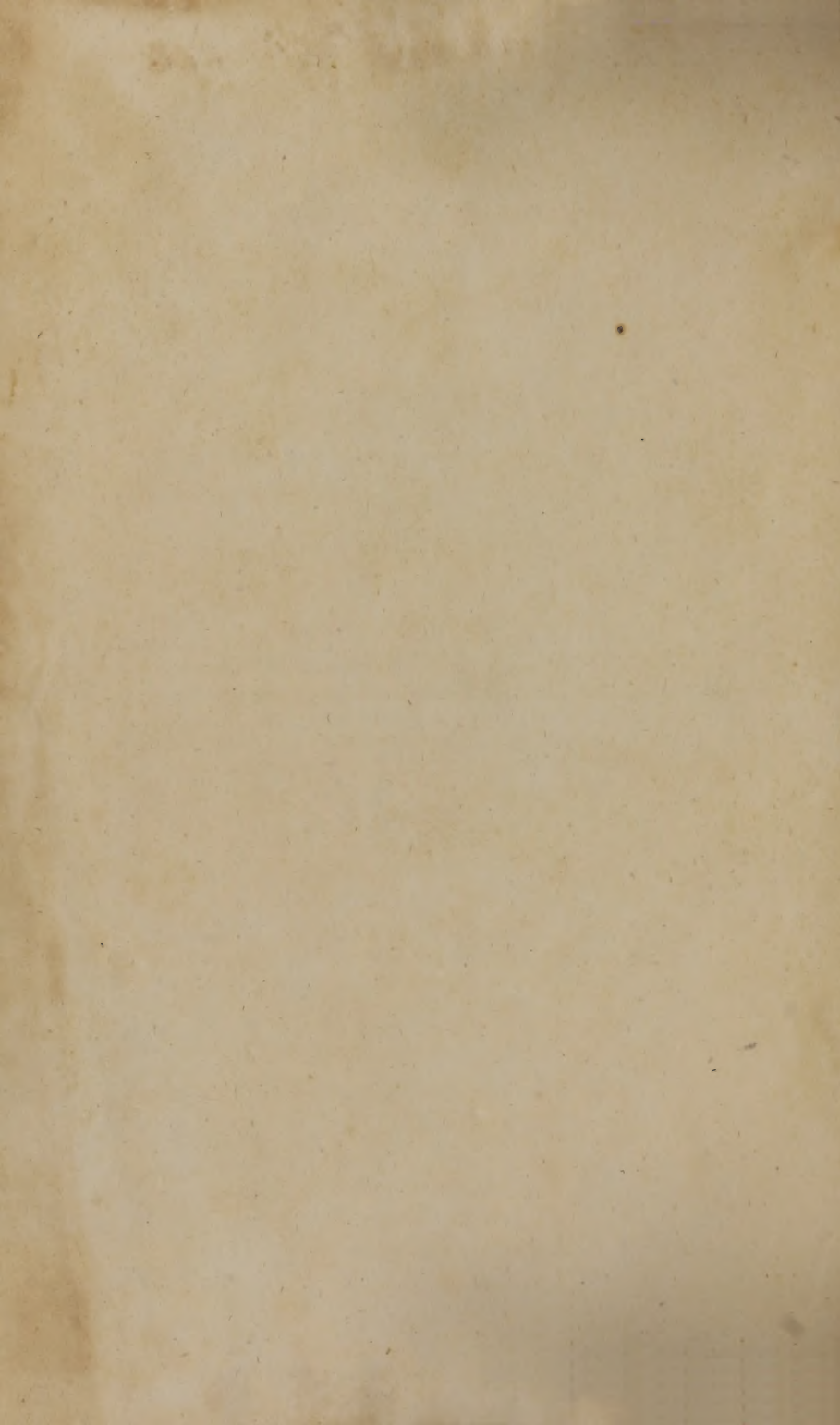
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